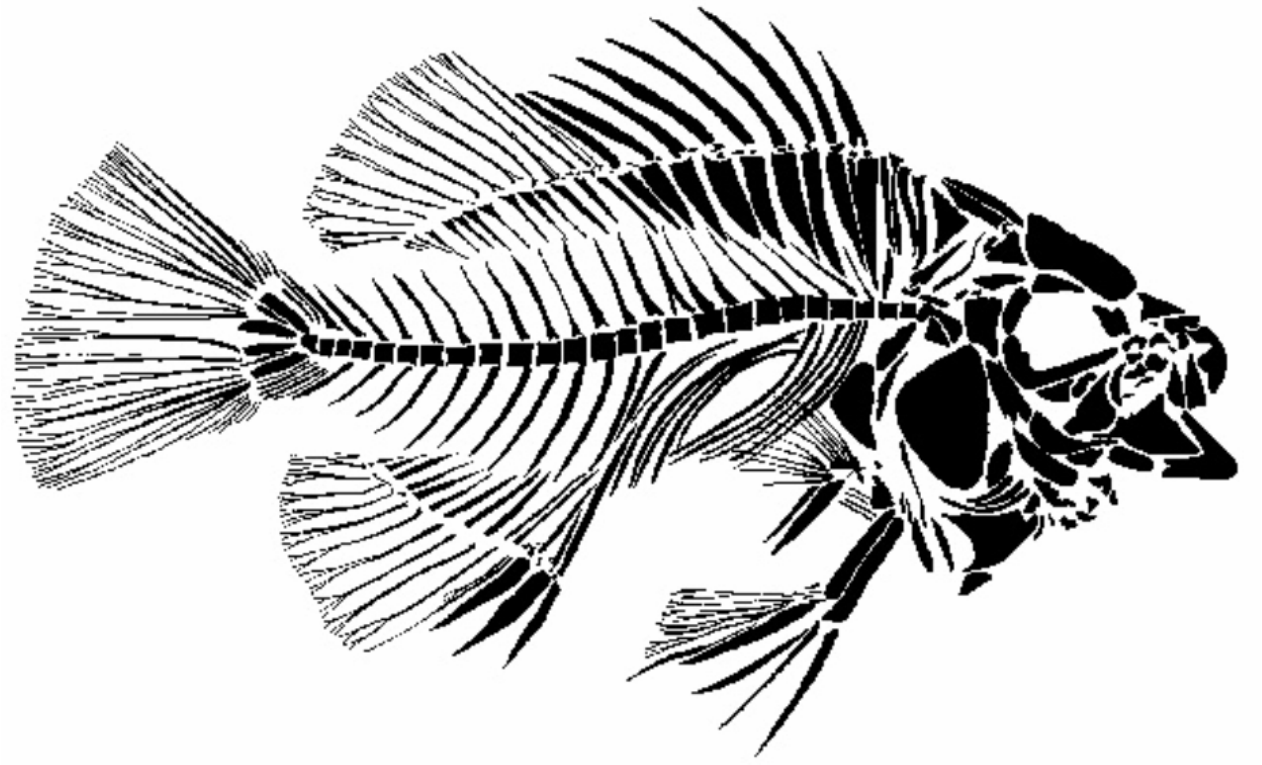
National Park Service
U.S. Department of the Interior

FOSSIL BUTTE NATIONAL MONUMENT
WYOMING

FIRE MANAGEMENT PLAN

Environmental Assessment/Assessment of Effect

October 2004



Environmental Assessment
Assessment of Effect

FIRE MANAGEMENT PLAN
Fossil Butte National Monument
2004

Summary
National Park Service (NPS) policy requires that any NPS unit with combustible vegetation must prepare a Fire Management Plan. Three alternatives were considered for the Fossil Butte National Monument Fire Management Plan – Alternative 1 - No-Action, continued suppression of wildland fires; Alternative 2 - NPS preferred action that would adopt a fire management program of appropriate management response to wildland fires while utilizing prescribed fire and mechanical treatments for fuels management; and Alternative 3 – appropriate management response to wildland fires coupled with mechanical fuels management. Suppression operations in each alternative would quickly respond to wildland fires and achieve effective control to protect human life and property with the least amount of damage to the park's natural and cultural resources. The alternative of wildland fire use was considered and rejected because Fossil Butte NM is not large enough to sustain free-burning fires without substantial risk to high value resources and park neighbors. Managing wildland fire for resource benefits also requires personnel with specialized skills and qualifications. It is unlikely that qualified personnel would be readily available to Fossil Butte NM within the time periods required by policy.

This environmental assessment analyzes impacts to firefighter and public safety; air quality; geology and soils; water resources; vegetation; wetlands; wildlife; visitor experience and park operations; and paleontological resources; and describes the cumulative effects of each alternative. None of the direct, indirect, or cumulative impacts of the proposed action are considered major for any of the impact topics.

Public Comment
Note to Reviewers and Respondents:

If you wish to comment on this environmental assessment, you may mail comments to the name and address below. This environmental assessment will be on public review for 30 days. Please note that names and addresses of people who comment become part of the public record. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. We will make all submissions from organizations, businesses, and individuals identifying themselves as representatives

or officials of organizations or businesses, available for public inspection in their entirety.

Please send comments to:

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Chapter 1 – PURPOSE AND NEED

Background

Fossil Butte National Monument comprises 8,198 acres, and is located about 10 miles west of Kemmerer, Wyoming, in Lincoln County (Figures 1, 2). The monument was established in 1972 by Public Law 92-537 (86 Stat.1069) for the purpose of preserving "… outstanding paleontological sites and related geological phenomena, and to provide for the display and interpretation of scientific specimens." The legislation directs management consistent with provisions of the NPS Organic Act (39 Stat. 535).

The Fossil Butte NM area is cold, high desert, with annual rainfall ranging generally from 9 to 12 inches. Most precipitation falls as snow.

Sagebrush is the predominant vegetation on rolling terrain at lower elevations. Basin big sagebrush, mountain big sagebrush, and alkali sagebrush dominate various communities. Mountain shrub communities occur at higher elevations on steeper slopes. Scattered stands of limber pine grow at higher elevations, particularly on north slopes. Aspen are common in areas near springs and on other moist substrates. Many steep slopes are essentially devoid of vegetation.

Sagebrush, aspen, and limber pine are the predominant vegetation communities at Fossil Butte NM. Fire is a natural component of these communities and one of the primary influences under which the communities developed. Natural fire ignitions have now been suppressed in the Fossil Butte NM area for nearly 100 years.

This appears to have been the general vegetation complex at the time of European settlement (Dorn, et al. 1984). Grazing by domestic sheep and cattle in the area began in the late 1800s and continued through 1989. Although some impacts of grazing remain evident, the vegetation community distribution and structure remain similar to the pre-grazing period. Other than grazing, the greatest influence on vegetation stand age and structure is the relative absence of fire in recent years.

Most of the lands that adjoin Fossil Butte National Monument are federal lands administered by the United States Department of the Interior (USDI) Bureau of Land Management.

The richest deposits of fossil fish are found in thin layers of sedimentary rock near the top of Fossil Butte. Vegetation where the fossil beds are exposed to the surface is generally absent or so sparse that it would not carry fire.

The Haddenham Cabin, located in the southern portion of the monument, is listed on the National Register of Historic Places (12/23/2003). The presence of historic quarries and other historic features in the vicinity of the Haddenham Cabin could result in the

area being listed as a District on the National Register of Historic Places at some time in the future.

Purpose

The purpose of this planning effort is to develop a fire management plan (FMP) at Fossil Butte National Monument. As part of that planning process, this Environmental Assessment (EA) analyzes fire management program alternatives and their direct, indirect and cumulative impacts. Three alternatives are analyzed: Alternative 1 - No-Action, continued suppression of wildland fires; Alternative 2 - NPS preferred action that would adopt a fire management program of appropriate management response to wildland fires while utilizing prescribed fire and mechanical treatments for fuels management; and Alternative 3 – appropriate management response to wildland fires coupled with mechanical fuels management. Under Alternative 2, prescribed fire may also be used to maintain historic fire-dependent communities or to meet other identified resource management objectives. Subsequent to this EA, a Fire Management Plan will be developed to direct fire management activities. That plan will identify Fire Management Units, values to be protected, and individual management actions in conformance with NPS fire management policies.

Need

The National Park Service's *Management Policies* (2001) and Director's Order 18 – Wildland Fire Management – require that each park area with vegetation capable of sustaining fire develop a plan to manage fire on its lands. To comply with NPS policy, Fossil Butte NM needs to have a comprehensive fire management program that protects natural and cultural resources, the public and employees, and park facilities. A Fire Management Plan that satisfies DO-18 requirements would be completed under any alternative selected, including Alternative 1 – the No Action alternative.

Scope of Plan

The scope of the Fire Management Plan is confined to areas within the authorized boundaries of Fossil Butte National Monument. Therefore, the Fire Management Plan would address the 8,198 acres of Fossil Butte NM. This EA considers impacts within Fossil Butte NM and adjacent areas that could reasonably be impacted by fire management actions.

Fire Planning Considerations

In compliance with the National Environmental Policy Act (NEPA), this EA describes for comparative purposes the potential effects of implementing alternative fire management programs at Fossil Butte National Monument. At the conclusion of the NEPA

process, an operational FMP will be written and approved in accordance with the selected alternative.

Included with the description of the preferred alternative is a typical 5-year fuels treatment plan (Appendix 3). This action plan defines fuels treatment activities proposed to be implemented during the 5-year period following the approval of the monument's FMP. The 5-year fuels plan is a dynamic document that is updated annually and is an example of possible future projects. As projects are completed, additional projects may be added provided they stay within the framework of this document. On an annual basis, the Fossil Butte NM and Grand Teton National Park staff would evaluate fuel and resource conditions, progress on treatments, results of past treatments, funding availability, and other issues to update the 5-year fuels treatment plan. Grand Teton National Park staff is involved because the fire management office at Grand Teton National Park provides fire management assistance to Fossil Butte NM. The plan and its updates would be consistent with the program objectives and the selected alternative defined in the FMP and the EA. In this way, the fire program incorporates an adaptive management approach into its planning and program implementation. To ensure on-going compliance with specific laws such as the National Historic Preservation Act and the Endangered Species Act, requisite consultation for resource impacts would be performed on a project-by-project basis unless a programmatic agreement has been developed and approved.

It is possible that during the FMP annual evaluation and update changes in park conditions or in policy and law may indicate that the fire management plan is no longer applicable. It is also possible that the fire program staff may propose a 5-year fuels treatment plan that is inconsistent with the FMP and EA. If Fossil Butte NM and Grand Teton National Park staffs decide to revise the FMP or 5-year fuels treatment plan, and if said revisions would result in new impacts not considered in the original FMP EA, then such a program change would necessitate additional NEPA analyses. Regardless of whether changes are made to the plan if new regulatory requirements, threatened and endangered species listings, or changes to the environment have occurred since the original EA, additional compliance would be required to continue implementing the program.

Fire History

Written records for fire occurrence within Fossil Butte National Monument only date to the mid-1970s and records for the surrounding area are scanty. Dorn et al., (1984) noted that all timber stands and many sagebrush stands showed evidence of past fire. The last fire that occurred in Fossil Butte NM was in 1982 and burned approximately 260 acres in timber, sagebrush, and mountain shrub communities.

Pre-European naturally-ignited fires within Fossil Butte NM would have occurred from June through August as is typical of fires in southwest Wyoming. It is also likely that burning by Native Americans and early Europeans affected the lands now included in

Fossil Butte NM. Many of these fires probably originated outside present-day Fossil Butte National Monument. Fire occurrence now is probably lower and fire size is smaller than would have occurred prior to the onset of ranching and fire suppression in the region. The potential for large fires originating outside of Fossil Butte NM to sweep over the area is diminished by wildland fire suppression and by the reduction in fine fuels due to grazing by domestic livestock.

Since detailed data regarding Fossil Butte NM's fire history is lacking, fire return intervals were estimated based on reviews of fire and vegetation management literature. The Fire Effects Information System (FEIS) indicates the following fire return intervals in various community types: aspen – 80 to 100 years; limber pine – 8 to 21 years for surface fires, 100 to 200 years for stand replacement fires; mountain shrub – 20 to 70 years; mountain big sagebrush – 10 to 30 years; basin big sagebrush – 15 to 70 years; and alkali sagebrush 20 – 70 years.

Kyte (2001) updated the years since the last fire occurred in several mixed conifer and sagebrush stands. In mixed conifer, the years since the last fire ranged from 34 to 83 years; half of the most recent fires were more than 60 years ago. The time since the last fire in four mountain big sagebrush stands was a little over 60 years, indicating at least one missed fire cycle. The time since the last fire in three basin big sagebrush stands was 60 to 70 years, indicating that these stands are at the long end of their fire return cycle. Many aspen communities exhibit considerable down and dead material, an indication that these communities too have not experienced fire in many years. Fire in many vegetation communities, then, has been absent for periods near the far extent of normal fire return intervals. Reintroduction of fire into these communities is desirable to maintain a diversity of stand ages and structures.

The various vegetation communities may be clumped in Northern Forest Fire Laboratory (NFFL) Fuel Models 1, 2, 5, and 8. Fuel model 1 is a grass model. Fire behavior in this model is characterized by high rates of spread and low resistance to control. The distribution of this model in Fossil Butte NM is quite limited. Fuel model 2 describes a forest community (e.g., limber pine) with open overstories and shrub/grass understories. Fire in this model is characterized by moderate rates of spread, relatively short flame lengths, and low resistance to control. Fuel model 5 is a shrub model; the model contains a live fuel moisture component necessary to predict fire behavior in sagebrush. Live fuel moisture of about 110% or less is necessary for fire to carry predictably in sagebrush (see Appendix 1 for the definition of live fuel moisture). Fires in sagebrush communities are usually wind driven and may exhibit moderate (6-15 ft.) flame lengths, moderate to high rates of spread, and fairly low resistance to control. Fuel model 8 is a timber model that describes aspen and mixed conifer stands with more closed canopies and less understory vegetation. Fire in this model is characterized by low rates of spread, short flame length, and somewhat greater resistance to control. Except under extreme conditions, firefighters with hand tools and engines could provide effective fire suppression in all these fuel models. When burning conditions are severe, aerial re-

sources such as retardant and/or helicopter water drops may be necessary for successful suppression.

The concept of fire regime is used to characterize the traits of a fire in a given vegetation type (Schmidt, et al. 2002). Traits can include how frequently fire occurs, the burn pattern created, and ecologic effects (see appendix 1 for definitions of fire regimes). Fire regime classification (Schmidt, et al. 2002) is useful to land managers because it aids in understanding how present ecosystems evolved. This understanding can be used for ecosystem restoration and maintenance utilizing fire, one of the forces that influence the ecosystem.

Most vegetation communities in Fossil Butte National Monument are characterized by relatively short fire return intervals (Appendix 2). Sagebrush-grass communities fall within Fire Regimes II and IV (fire return intervals of 10-90 years for stand replacing fire), limber pine falls within Fire Regimes I and IV/V, and aspen generally falls within Fire Regime III. This suggests that fires of varying intensities naturally recurred at intervals of 100 years or less in Fossil Butte NM.

Condition Class describes the ecological state of a vegetation community or stand in the context of natural disturbances; i.e. whether the community or stand has experienced disturbances within the natural range of variability. Condition Class 1 means that, even though fire may have been excluded for a considerable time, the present fuel condition is such that the response to fire would be within the range of historic variability (i.e., fire effects would be in the expected range and there would be a low risk of losing key ecosystem components). Condition Class 2 means that an area has missed at least one fire return interval but the effects of a new fire would probably remain within the range of historical variability. Communities or stands in Condition Class 3 may have missed several fire returns or may be strongly influenced by other factors such as the invasion of nonnative plants. Wildland fires in these communities or stands would likely exhibit fire behavior and fire effects outside the natural range of variability. Some treatment of fuels in Condition Class 3 communities is usually necessary to convert the communities back to Condition Class 1 or 2 before wildland fire can be reintroduced without the likelihood of undesirable fire effects.

Most vegetation communities in Fossil Butte NM are in Condition Class 1 or 2. The alkali or low sagebrush, grass-forb, and some of the mountain big sagebrush, mountain shrub, and limber pine/Douglas-fir communities appear to be in mid- to late stages of Condition Class 1. The aspen, basin big sagebrush, and some of the mountain big sagebrush, mountain shrub, and limber pine/Douglas-fir communities appear to be in Condition Class 2 largely because of past fire exclusion.

Please see Appendix 1 for further definitions and descriptions of NFFL Fuel Models, Fire Regimes, and Condition Classes. Appendix 2 provides a preliminary assessment of Condition Classes by fuel type at Fossil Butte National Monument.

Relevant Laws, Policies and Planning Documents

A multitude of laws, regulations, and policies influence development and implementation of a Fire Management Plan at Fossil Butte National Monument. The following relate directly to preparation of a Fire Management Plan and Environmental Assessment for Fossil Butte National Monument.

NPS Organic Act of 1916 – Congress directed the U.S. Department of the Interior and NPS to manage units "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 U.S.C. § 1). Congress reiterated this mandate in the Redwood National Park Expansion Act of 1978 by stating that the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 U.S.C. § 1 a-1).

National Environmental Policy Act (NEPA) – The purpose of NEPA is to encourage productive and enjoyable harmony between man and his environment; to promote efforts which would prevent or eliminate damage to the environment and stimulate the health and welfare of mankind; and to enrich the understanding of the ecological systems and natural resources important to the Nation. NEPA requirements can be satisfied by completion of a Environmental Impact Statement (EIS) or Environmental Assessment (EA) and a decision document (Finding of No Significant Impact or Record of Decision), or by a Categorical Exclusion (CE).

National Historic Preservation Act (NHPA) – The purpose of NHPA is to ensure the consideration of historic properties in the planning and implementation of land use and development projects. Section 106 requires federal agencies to assess the effects of their undertakings on historic properties and provides for review of those undertakings by the public and by the Advisory Council on Historic Preservation.

Director's Order 12 (DO- 12) – DO-12 is the NPS guidance for Conservation Planning, Environmental Impact Analysis, and Decision Making. DO-12 provides the guidelines for implementing NEPA according to NPS regulations. DO-12 meets all Council on Environmental Quality (CEQ) regulations for implementing NEPA. In some cases, NPS has added requirements under DO-12 that exceed the CEQ regulations.

Director's Order 18 (DO- 18) – DO-18, the NPS guidance for Wildland Fire Management, states that "every NPS unit with burnable vegetation must have an approved Fire Management Plan." DO-18 defines what an approved FMP must in-

clude, stressing that "firefighter and public safety is the first priority" and promoting "an interagency approach to managing fires on an ecosystem basis across agency boundaries." Director's Order 18 also directs parks to identify, manage, and reduce, where appropriate, accumulations of hazardous fuels. Procedures for completion, review, approval, and required contents for FMPs are provided in Reference Manual-18 (RM-18). Until an FMP is approved, NPS units must take suppression action on all wildland fires.

The Federal Wildland Fire Management Policy and Program Review (USDA/USDI 1995) and Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide (USDA/USDI 1998) provide specific guidance on fire policy, planning and implementation. A more complete listing of relevant laws, Executive Orders, and policies is provided in Table 1 by impact topic.

A Fire Management Plan and EA for Fossil Butte National Monument must be consistent with other approved plans for the unit. The General Management Plan (GMP) for Fossil Butte National Monument, completed in 1980, is silent on the issue of fire management. The most recent Statement for Management (1996) focuses strongly on paleontological resources and related issues; it does not mention fire management. The Resource Management Plan, completed in 1994, notes that the current fire management program consists of immediate suppression of wildland fires and identifies the need for additional planning to incorporate prescribed burning into the program. The Grazing Impact Study (Dorn et al., 1984) and draft Vegetation Management Plan (Kyte 2001) both recommend use of fire to restore and maintain native vegetation communities. The Fossil Butte National Monument Natural Resource I&M Data report (NPS 2002) provides considerable information on a variety of natural resources. A draft Fire Management Plan for Fossil Butte NM was completed in 1989 but was not approved and implemented. Changes in federal fire policy, NPS policies, and required plan formats since 1989 dictate that a new plan be written.

Objectives

Management objectives that relate to resource management are presented in the Statement for Management (1996) and General Management Plan (1980). These include:

- Preserve for the benefit and enjoyment of present and future generations outstanding paleontological sites and related geological phenomena.

- Conserve and use wisely the scenery, natural resources, historic objects, and the wildlife of Fossil Butte National Monument in such manner and by such means as will leave them unimpaired for future generations.

Fire management objectives, tiered from resource management objectives, include the following:

- Ensure that safety of firefighters and the public is the highest priority on every fire management action.
- Manage fire cooperatively with adjacent agencies and landowners.
- Manage fire as a process while meeting resource protection goals and resource management objectives.
- Suppress all wildland fires regardless of ignition source to protect the public, private property, and natural, cultural, and historic resources of the unit, utilizing strategies commensurate with values at risk.
- Apply fuel management practices to reduce hazard fuel accumulations that threaten park resources and neighboring lands.

Scoping Issues and Impact Topics

Scoping

Internal scoping was conducted with Fossil Butte National Monument's Interdisciplinary Team, Grand Teton National Park's fire management staff, and Intermountain Regional fire management staff on December 5, 2002. The park also conducted external scoping with tribes, local, state and federal agencies, and the general public for a 30-day period from February 28 through March 30, 2003. Parties contacted by letter (February 28) or press release (February 26) are noted in Chapter 4. Tribes were contacted through a separate letter dated February 25, 2003. Comments were requested by March 30, 2003.

Impact Topics

Issues and concerns affecting this project were identified by NPS specialists; no additional issues were identified through external scoping. After scoping, issues and concerns were distilled into distinct impact topics to facilitate the analysis of environmental consequences, providing for a standardized comparison between alternatives based on the most relevant information. The impact topics were identified on the basis of federal laws, regulations, and orders; NPS *Management Policies*; and NPS knowledge of limited or easily impacted resources.

Topics analyzed in this EA include: firefighter and public safety; air quality; geology and soils; water resources; vegetation; wetlands; wildlife; visitor experiences and park operations; archeological resources and historic structures; and paleontological resources. Each of these impact topics is individually addressed later in this EA.

Impact Topics Dismissed from Further Consideration

NEPA and CEQ regulations direct agencies to "avoid useless bulk…and concentrate effort and attention on important issues" (40 CFR 1502.15). Certain impact topics that are sometimes addressed in NEPA documents for other kinds of proposed actions or projects have been judged not to be substantively affected by any of the Fire

Management Plan alternatives considered in this EA. These topics are listed below and in Table 1, and a rationale is provided for dismissing specific topics from further consideration.

Threatened and Endangered Species: In a letter dated June 2, 2003 the Cheyenne, Wyoming office of the U.S. Fish and Wildlife Service (FWS) identified the potential for two threatened, endangered, or candidate species within the monument: the endangered black-footed ferret, and the candidate mountain plover. In a letter dated March 11, 2004 FWS advised that the proposal for listing the mountain plover had been withdrawn (September 8, 2003), and that they would no longer be reviewing project impacts to this species under the Endangered Species Act (ESA). The FWS also advised that the monument and immediately adjacent areas do not support large enough prairie dog populations to meet the threshold of a 200-acre complex necessary to support black-footed ferrets. The FWS concluded that there is no suitable habitat for ferrets in the monument. Therefore, the impact topic of Threatened and Endangered Species has been dismissed from further analysis in this EA.

Floodplains: The streams in Fossil Butte National Monument are sufficiently high in the watershed that there are no real floodplains. Flash flooding is not a common occurrence within the monument. Therefore, this impact topic is dismissed from further analysis in this EA.

Cultural Resources: These three components of cultural resources are dismissed from further consideration and will not be analyzed in this EA.

Museum Objects: Museum objects exist within the context of a built environment, and rarely have the potential to be affected by wildland fire.

Cultural Landscapes: No cultural landscapes have been identified within the monument. If cultural landscapes that might be affected by wildland or prescribed fire are identified in the future, those landscapes will be appropriately protected during project implementation and addressed in an update of the Fire Management Plan.

Ethnographic Resources: No ethnographic resources are known to exist in the monument. Regional Tribes were contacted during the scoping process and will be included in the review of this EA. If ethnographic resources that might be affected by wildland or prescribed fire or mechanical fuel reduction projects are identified during this review, consultation with the tribes and the SHPO will be initiated. Appropriate protection measures will be implemented based on consultation. Revision of the Fire Management Plan will reflect new information regarding ethnographic resource protection.

Noise: Noise is defined as an unwanted sound. Hazard fuels reduction, hazard tree removal, prescribed fires, and fire suppression can all involve the use of noise-generating equipment such as chainsaws, trucks and aircraft. Each of

these fire management tools, especially chainsaws and helicopters, is quite loud (in excess of 100 decibels) and operators are directed to use hearing protection equipment. Noise would be quickly dissipated in the open environments of Fossil Butte NM and would have a negligible impact for all alternatives. Further, the use of such equipment would be extremely infrequent in light of the fuel types at Fossil Butte NM (hours or days per decade). This is not frequent enough to substantively interfere with human activities in the area or with wildlife behavior. Such infrequent noise would not chronically impair the solitude and tranquility associated with Fossil Butte NM. Therefore, this impact topic is dismissed from further analysis in this EA.

Waste Management: None of the fire management alternatives would generate noteworthy quantities of either hazardous material or solid wastes that need disposal in hazardous waste or general sanitary landfills. Therefore, this impact topic is dismissed from further analysis in the EA.

Transportation: None of the FMP alternatives would substantively affect road, railroad, water-based, or aerial transportation in and around Fossil Butte National Monument. One exception may be the temporary closure of nearby roads during fire suppression or prescribed burning activities or from dense smoke from such fires. However, as evidenced by recent fire history, such closures would be very infrequent and would not substantially impinge on local transportation. Therefore, this impact topic is dismissed from further analysis.

Utilities: Some types of projects involving construction may temporarily impact telephone, electrical, natural gas, water, and sewer lines, potentially disrupting service to customers. Other projects may exert increased demand on telephone, electrical, natural gas, water, and sewage infrastructure sources and services, thus compromising existing services or creating a need for new facilities. None of the FMP alternatives would cause any of these effects to any extent. Therefore, this impact topic is dismissed from further analysis.

Land Use: Vegetation at Fossil Butte National Monument consists primarily of sagebrush, stands of limber pine and Douglas fir, and aspen communities. Visitor and administrative facilities, as well as historic structures, are located within Fossil Butte NM. Ranching, industrial, and commercial land uses occur in areas outside the boundaries. Fire management would not affect land uses within Fossil Butte NM or in areas adjacent to it. Therefore, this impact topic is dismissed from further analysis.

Socioeconomics: NEPA requires an analysis of impacts to the "human environment" which includes economic, social and demographic elements in the affected area. Implementation of the proposed action, particularly prescribed burning, may require temporary closures of project areas which may, in turn, in-

convenience some park visitors. Such closures, however, are likely to be small in size and of very short duration. Some fire management activities may bring a short-term need for additional personnel in the monument, but that would not substantially affect local businesses. Thus the proposed action would not impact local businesses or other agencies. Therefore, the socioeconomic environment will not be addressed as an impact topic in this document.

Environmental Justice: Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Executive Order 13045 requires federal actions and policies to identify and address disproportionately adverse risks to the health and safety of children. None of the FMP alternatives would have disproportionate health or environmental effects on minorities or low-income populations or communities as defined in the Environmental Protection Agency's Environmental Justice Guidance (1998). Therefore, environmental justice was dismissed as an impact topic in this document.

Prime and Unique Farmlands: In August of 1980, the Council on Environmental Quality (CEQ) directed that federal agencies must assess the effects of their actions on farmland soils classified by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) as prime or unique. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seeds; unique farmland produces specialty crops such as fruits, vegetables, and nuts. According to the NRCS, no soils in the project area are classified as prime and unique farmlands. Thus, the topic of prime and unique farmland will not be addressed as an impact topic.

Wilderness: NPS *Management Policies* direct that proposed actions which have the potential to impact wilderness resources must be evaluated in accordance with NPS procedures for implementing NEPA. Since neither Fossil Butte National Monument nor adjacent lands are proposed or designated as wilderness, this impact topic was dismissed from further analysis.

Indian Trust Resources: Indian trusts are assets owned by Native Americans but held in trust by the United States. Indian trusts do not occur within Fossil Butte National Monument and, therefore, are not evaluated further in this document.

Resource Conservation: The NPS *Guiding Principles of Sustainable Design* provides a basis for achieving sustainability in facility planning and design, emphasizes the importance of biodiversity, and encourages responsible decisions. The

guidebook articulates principles to be used such as resource conservation and recycling. None of the FMP alternatives would minimize or add to resource conservation or pollution prevention on Fossil Butte NM. Therefore, this impact topic is dismissed from further analysis in this EA.

Table 1.1. Summary of Impact Topics.

Impact Topic	Retained or dismissed from further evaluation	Relevant Laws, Regulations or Policies
Firefighter and Public Safety	retained	Director's Order #18; NPS *Management Policies*
Geology and Soils	retained	NPS Organic Act; NPS *Management Policies*
Air Quality	retained	Clean Air Act (CAA); CAA Amendments of 1990; NPS Organic Act; NPS *Management Policies*
Water Resources	retained	Clean Water Act; Executive Order 12088; NPS *Management Policies*
Floodplains and Wetlands	Floodplains dismissed Wetlands retained	Executive Order 11988; Executive Order 11990; Rivers and Harbors Act; Clean Water Act; NPS Organic Act; NPS *Management Policies*
Vegetation	retained	NPS Organic Act; NPS *Management Policies*
Wildlife	retained	NPS Organic Act; NPS *Management Policies*
Threatened and Endangered Species	dismissed	Endangered Species Act
Visitor Experience and Park Operations	retained	Americans with Disabilities Act; NPS Organic Act; NPS *Management Policies*
Paleontological Resources	retained	NPS Organic Act; NPS *Management Policies*
Cultural Resources	archeology and historic structures retained Museum Objects dismissed Cultural Landscapes dismissed Ethnographic Resources dismissed	Section 106 of National Historic Preservation Act; Archeologic and Historic Preservation Act; Archeological Resources Protection Act; 36 CFR 800; NEPA; Executive Order 13007; Executive Order 11593; the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation; Programmatic Memorandum of Agreement Among the NPS, Advisory Council on Historic Preservation, and the National Council of State Historic Preservation Officers ((1995); Director's Order 28; NPS *Management Policies*
Noise	dismissed	NPS *Management Policies*
Waste Management	dismissed	NPS *Management Policies*
Transportation	dismissed	NPS *Management Policies*
Utilities	dismissed	NPS *Management Policies*
Land Use	dismissed	NPS *Management Policies*
Socioeconomics	dismissed	40 CFR Regulations for Implementing NEPA; NPS *Management Policies*

Impact Topic	Retained or dismissed from further evaluation	Relevant Laws, Regulations or Policies
Environmental Justice	dismissed	Executive Order 12898
Prime and Unique Farmlands	dismissed	Council on Environmental Quality 1980 memorandum on prime and unique farmlands
Wilderness	dismissed	The Wilderness Act; Director's Order #41; NPS *Management Policies*
Indian Trust Reserves	dismissed	Department of the Interior Secretarial Orders No. 3206 and No. 3175
Resource Conservation	dismissed	NEPA; NPS *Guiding Principles of Sustainable Design*; NPS *Management Policies*

Chapter 2 – ALTERNATIVES CONSIDERED

Alternatives were framed through discussions among Fossil Butte National Monument personnel, Grand Teton National Park's fire management staff and Intermountain Region fire management staff. The alternatives cover the range of what is physically possible, acceptable by policy, and feasible for local managers; i.e. all reasonable alternatives. Under each alternative, the monument would be managed as a single Fire Management Unit. Under Alternative 2, prescribed burning would occur in sagebrush, limber pine, and aspen communities. Under Alternatives 2 and 3, hazard fuels projects would be conducted primarily near the Haddenham Cabin and visitor use areas. With all alternatives, wildland fires would be suppressed.

Alternative 1 - No- Action

This alternative represents a continuation of current management actions; it does not mean an absence of active management of fire. Under the no-action alternative, the fire management program would consist of suppressing wildland fires as quickly as possible.

Suppressing wildland fires is accomplished by depriving a fire of additional fuels (e.g., building a fire line that is cleared down to mineral soil) or by cooling the fire sufficiently to prevent further combustion (e.g., applying water to the flaming front).

Predicting the average annual acreage of wildland fire is quite uncertain, dependent as it is on climatic conditions, fuels conditions, locations and other factors. Given recent fire history and the age of various vegetation communities, this analysis projects that one or two wildland fires would occur sometime during the next 10 to 20 years. The size of such fires is unknown but, for purposes of this EA, the analysis projects a total of 200 acres.

The no-action alternative includes a continued absence of mechanical fuels treatments and no use of prescribed fire.

Alternative 2 – Appropriate Management Response and Integrated Fuels Management (preferred alternative)

The preferred alternative would incorporate continued suppression of all wildland fires using the appropriate management response, mechanical treatment of hazard fuels, and the use of prescribed fire to meet hazard fuel reduction and resource management objectives.

Appropriate management response (AMR) provides for the full range of suppression strategies for management of wildland fires. The acreage burned by wildland fire may increase slightly from Alternative 1 since fire managers would have the option of selecting from the full range of suppression strategies. Under this scenario, managers may choose to utilize natural or man-made barriers in a confine strategy to increase firefighter safety, lower cost, or minimize the impacts of suppression actions. Resource

benefits from wildland fire will not be utilized as a consideration in the selection of the management strategy.

Director's Order 18 directs parks to identify, manage, and reduce where appropriate, accumulations of hazardous fuels. Mechanical treatment would be used to clear vegetation away from structures, cultural resources, and other high value resources to reduce wildland fire spread potential and increase defensible space.

Prescribed fire and mechanical treatments may be used individually or in combination (including sequence; i.e., mechanical treatment followed by burning) to achieve natural resource and fuels management objectives. Each treatment would involve developing an implementation plan and obtaining appropriate permits and approvals. All prescribed fires would be planned and approved consistent with the method and format required by RM-18.

Mechanical reduction of hazard fuels would use methods such as falling or limbing trees, brush removal, and mowing. Such projects would be in the vicinity of visitor use areas and high value resources (e.g. Haddenham Cabin). The actions would generally be limited to the level needed to provide for visitor safety and defensible space. Individual implementation plans would specify the extent of vegetation reduction.

Prescribed burning may be conducted for hazard fuels reduction and maintenance of fire dependent communities. Pile burning may be used to dispose of materials generated in mechanical hazard fuels projects. Vegetation communities that have evolved with some fire influence include aspen, limber pine, and sagebrush. The extent and location of individual treatments would be identified in prescribed fire burn plans.

Wildland fire used for resource benefit (allowing naturally ignited wildland fire to burn under specific conditions in order to accomplish resource benefits) would not be permitted.

During a typical 5-year period, the following fire and fuels management activities would be implemented:

- One or two wildland fires totaling about 200 acres may be expected. These would be suppressed using an appropriate management response. Given the past fire history of one fire since 1982, wildland fire may not occur in several 5-year periods.
- Two to four prescribed fires in sagebrush, aspen, and/or limber pine communities.
    - Prescribed fires in individual stands of aspen and limber pine would seldom exceed 50 acres.
    - Prescribed fires in sagebrush would be designed with consideration of sage grouse concerns. Specific mitigations would consider proximity to sage grouse leks, timing of burns in relation to nesting and brood rearing

habitat and timeframes, and the extent and frequency of disturbance near leks and winter habitats. An exception to the limitations mentioned above in the description of prescribed fire would be a prescribed fire in sagebrush proposed as part of a larger BLM project (Rock Creek Prescribed Burn, 17,000 acres). This project is proposed as a fall burn in the first 5-year period and would include portions of a 1595-acre parcel within the monument. Approximately 30-60% (358 – 716 acres) of the mountain big sagebrush and basin big sagebrush in this unit would be consumed. Alkali sage would not be targeted during ignition and is not expected to burn. Conifer stands within the unit would not be targeted for burning. See Appendix 3 and Figure 4 for proposed actions within the first 5-year period.

- Two to four mechanical fuels reduction projects totaling fewer than 50 acres. These would occur primarily near facilities, visitor use areas and historic structures (e.g., Haddenham Cabin). Woody material would be hand-piled for later removal or disposal. See Appendix 3 and Figure 4 for proposed actions within the first 5-year period.
- Pile burning to dispose of removed biomass from hazard fuels reduction projects. Pile burning may occur in scattered locations during 2 or 3 years of a typical 5-year period.

Alternative 3 – Appropriate Management Response and Non- fire Fuels Management

This alternative is similar to Alternative 2 except that use of broadcast prescribed burning would not be permitted. Using an appropriate management response to wildland fire, fire managers may choose to utilize natural or man-made barriers in a confine strategy to lower cost, increase firefighter safety, or minimize the impacts of suppression actions. Mechanical treatment of hazard fuels would be the same as under Alternative 2 with piles being burned post-treatment. The acreage burned by wildland fires may increase slightly from Alternative 1 since fire managers would have the option of selecting from the full range of suppression strategies.

During a typical 5-year period, the following fire and fuels management activities would be implemented:

- One or two wildland fires totaling about 200 acres may be expected. These would be suppressed using an appropriate management response. Given the past fire history of one fire since 1982, wildland fire may not occur in several 5-year periods.
- Two to four mechanical fuel reduction projects totaling fewer than 50 acres. These would occur primarily near facilities, visitor use areas, and historic structures (e.g., Haddenham Cabin). Woody material would be hand-piled for later removal or disposal.
- Pile burning of removed biomass would be permitted. See Appendix 3 and Figure 4 for proposed actions within the first 5-year period.

Mitigation as a Part of All Alternatives
Given the uncertainty of the locations of wildland fires and the relatively small acreage that may be burned with prescribed fire or treated by hazard fuels projects, the mitigations for all alternatives will focus primarily on wildlife and plant species, paleontological resources, cultural resources, and management constraints. Fossil Butte National Monument will adhere to Minimum Impact Suppression Tactics (MIST). MIST is the concept of selecting the minimum tool needed to safety and effectively suppress wildland fire while minimizing the long term effects of suppression actions.

The Wyoming Natural Diversity Database has identified eight plants that they consider "species of special concern." These include Sodaville milkvetch (*Astragalas lentiginosus* var. *salinus*), Martin ceanothus (*Ceanothus martini*), western dodder (*Cuscuta occidentalis*), entire-leaved peppergrass (*Lepidium integrifolium* var. *integrifolium*), Wasatch biscuitroot (*Lomatium bicolor* var. *bicolor*), ternate desert-parsley (*Lomatium triternatum* var. *anomalum*), Payson beardtongue (*Penstemon paysoniorum*), and tufted twinpod (*Physaria condensata*). Many of these plant species occur in habitats that are relatively unsusceptible to wildland fire. Proposed mitigation includes (a) avoidance of peppergrass populations with prescribed fire (Alternative 2) and (b) avoidance as much as possible of off-road vehicle use near populations of all of the species listed above. Off-road vehicle use would be limited to emergency actions in the vicinity of populations of these plants.

Fire management actions identified under all alternatives have little potential to adversely affect paleontological resources or areas with possible fossil-bearing deposits. This is due to the paucity of flammable vegetation in areas known to contain fossil deposits.

To prevent the potential crushing of fossil remains, vehicle traffic associated with a wildland fire, prescribed fire, and mechanical removal of hazard fuels will be prohibited in known fossil-bearing areas. To preserve these resources during fire suppression operations, an assigned Resource Advisor will be consulted regarding locations and shapes of firelines and concerning other ground-disturbing operations.

Fire management actions identified under all alternatives have little potential to adversely affect the cultural resources that occur at Fossil Butte National Monument (cultural resources are identified in Chapter 3). Mitigations to further ensure avoidance of impact include:

- Complete appropriate pedestrian survey and Section 106 (NHPA) consultation with Wyoming SHPO prior to planned fire management projects (prescribed fire or manual fuel reduction).
- Use rubber-tired vehicles in fire suppression, prescribed burning, and mechanical hazard fuels reduction projects to minimize the potential of disturbing archeological sites.

- Use water and/or natural barriers as much as possible rather than constructing handline to contain wildland and prescribed fires to minimize the potential of disturbing archeological sites.
- Use a suite of mitigation actions, either individually or in combination, to reduce the potential effect of wildland fires and suppression actions on the historic Haddenham Cabin. These include blacklining around the structures, treating with fire retardant foam concurrent with fires, wrapping with heat reflective materials, and establishing sprinkler systems on and around the Cabin concurrent with wildland fire suppression activities.
- Monitor fire management activities and halt work if previously unknown resources are located; protect and record newly discovered resources.
- Brief suppression, prescribed fire, and hazard fuels personnel about protecting cultural resources.
- In fire suppression operations, protection of structures and features will be more important than minimizing acres burned.
- A Resource Advisor will be assigned to wildland fire suppression efforts.

Additional management constraints which would further mitigate potential adverse impacts of wildland fire suppression under all alternatives include:

- Minimum impact suppression tactics would be employed in all tactical operations except as noted below.
- Fire retardant, if used, must be on the approved list of retardants used by the U.S. Forest Service and USDI Bureau of Land Management.
- Motorized equipment would not normally be used off of established roadways in the monument. However, due to rapid rates of spread and the emergency nature of fires near the boundary, off-road use of motorized equipment such as all-terrain vehicles and wildland fire engines may be authorized by the Superintendent.
- All extended attack and prescribed fire operations would have a park employee designated and available to assist suppression operations as a Resource Advisor. If qualified employees were not available, a Resource Advisor would be ordered through the interagency dispatch system.
- Helicopters may be used to transport personnel, supplies and equipment. Improvement of landing sites would be kept to a minimum and would include consultation with the assigned Resource Advisor. Helibases and landing sites within the monument would be rehabilitated to pre-fire conditions to the extent reasonably possible.
- Suppression actions would avoid aerial and ground applications of retardant or foam within 300 feet of identified water sources.
- Except for spot maintenance to remove obstructions, no modifications would be made to roadways, trails, water sources, or clearings. All sites where modifications are made or obstructions removed would be rehabilitated to pre-fire conditions to the extent reasonably possible.

- Earth moving equipment such as tractors, graders, bulldozers, or other tracked vehicles would not be used for fire suppression or prescribed fire. If special circumstances warrant extreme measures to ensure resource protection, the Superintendent may authorize the use of heavy equipment.
- Fireline location would avoid sensitive areas wherever possible.
- Following fire suppression activities, firelines would be re-contoured and waterbarred where appropriate.
- As a matter of practice, burned areas would not be reseeded unless there are overriding concerns about establishment of invasive nonnative species. Any reseeding would be with native species and occur only with the Superintendent's prior approval.

Additional Mitigation as Part of Alternatives 2 and 3

- Hazard fuels removal around the Haddenham Cabin would mitigate the potential for impacts from wildland fires. Monument staff will complete Section 106 consultation with the Wyoming State Historic Preservation Officer (SHPO) prior to implementing either manual/mechanical or prescribed burn hazard fuel reduction projects.
- Disposal of slash in areas lacking cultural sites; avoid ground disturbance in areas containing known cultural sites.

Additional Mitigation as Part of Alternative 2

- For prescribed fires and hazard fuel reduction projects, mitigations would be included in the project implementation plan. The Wyoming SHPO requests that further consultation be conducted on each prescribed fire during preparation of the prescribed fire burn plan.
- The presence or absence of special-status species in the area would be determined during the project-planning phase of prescribed fire or hazard fuels treatment projects. Park resource specialists would evaluate existing databases and maps, and, if necessary, request additional surveys or field verification. Consultation with the U.S. Fish and Wildlife Service is required under section 7 of the Endangered Species Act if a planned project or suppression activity could cause an adverse impact on federally listed species. Fossil Butte National Monument does not include suitable habitat for federally listed threatened and/or endangered species.

Alternatives Considered and Rejected

Two additional alternatives were identified and considered in the scoping process. Neither was regarded as reasonable within the context of NPS policies (Director's Order 12, Section 2.7B); both were therefore eliminated from further analysis. Section 2.7B identifies as unreasonable alternatives those which could not be implemented if they were chosen, which cannot be implemented for technical or logistical reasons, that do not

meet park mandates, that are not consistent with management objectives, or that may have severe environmental impacts.

Alternative 4 was called the wildland fire use alternative. This alternative would employ the full range of available fire management strategies including suppression using an appropriate management response, wildland fire use and prescribed burning. Mechanical fuel reduction methodologies would be the same as under Alternatives 2 and 3. This alternative differs from other alternatives in its authorization of wildland fire use (i.e. wildland fire used for resource benefit). This alternative was rejected because Fossil Butte National Monument is not of sufficient size to manage free-burning fires without substantial threat to high value resources and/or park neighbors. Managing wildland fire for resource benefits also requires personnel with specialized skills and qualifications. It is unlikely that qualified personnel would be readily available to Fossil Butte NM within the time periods required by policy.

Alternative 5, the no management alternative, would allow all wildland fires to burn unimpeded by management action. No other manipulative activities (e.g., hazard fuels management) would be permitted. This alternative was rejected because it compromises public safety, causes undue risk to values to be protected (e.g. historic structures) and is inconsistent with federal policy and regulations.

Environmentally Preferred Alternative

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which is guided by the Council on Environmental Quality (CEQ). The CEQ provides direction that "the environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA's Section 101" (*Forty Most Asked Questions Concerning Council on Environmental Quality's National Environmental Policy Act Regulations*, 1981.)

Section 101 of the National Environmental Policy Act states that "…it is the continuing responsibility of the Federal Government to … (1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations; (2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings; (3) attain the widest range of beneficial uses of the environment without degradations, risk to health or safety, or other undesirable and unintended consequences; (4) preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment which supports diversity and variety of individual choice; (5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and (6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources." The environmentally preferable alternative for this project is based on these national environmental policy goals.

Alternative 1 – No- Action. This alternative would suppress all wildland fires. This alternative would disturb the least amount of natural resources, but the vegetation communities in Fossil Butte National Monument are regarded as fire dependent. The alternative would not be as effective as Alternative 2 in maintaining the structure and diversity of those communities. The no-action alternative may also expose firefighters to somewhat elevated risks as well as potentially increased costs since it does not allow for use of the full range of appropriate management responses. Therefore, this alternative would not result in the same level of protection of natural and cultural resources and people over the long-term as would occur with the preferred alternative. Consequently, the no-action alternative does not satisfy provisions 2, 3, and 4 of NEPA's Section 101.

Alternative 2 – Appropriate Management Response and Integrated Fuels Management (Preferred Action). This alternative provides the greatest flexibility in responding to wildland fire and further provides the greatest opportunities for effective management of hazardous fuels. It provides the lowest risk to firefighters by utilizing an appropriate management response (i.e. the full range of suppression strategies) to wildland fires. It provides opportunities for selection of individual or composite treatments of hazardous fuels, and thus should be most effective in managing such fuels. The hazardous fuels reduction program would ultimately provide for better health and safety of visitors and employees and protection of natural and cultural resources for succeeding generations. This alternative further provides for prescribed fire treatments intended to contribute to the maintenance of long-term stability and diversity in fire-dependent vegetation communities. The alternative would protect people and cultural and natural resources with minimum disturbance. This alternative would satisfy each of the provisions of the national environmental policy goals.

Alternative 3 – Appropriate Management Response and Non- fire Fuels Management. This alternative is intermediate between the no-action (Alternative 1) and preferred action (Alternative 2) alternatives. The ability to employ an appropriate management response brings some of the benefits associated with Alternative 2. Mechanical treatments would still be available for hazardous fuel reductions, but these methods are ineffective tools for maintaining the long-term stability and diversity of fire dependent communities. The inability to use prescribed fire, then, renders this alternative less effective in achieving resource management goals. Consequently, Alternative 3 does not satisfy provisions 2 and 4 of NEPA's Section 101 as well as the preferred alternative.

The environmentally preferable alternative is Alternative 2 – Preferred Action because it surpasses the no-action alternative and Alternative 3 in realizing the full range of national environmental policy goals as stated in §101 of the National Environmental Policy Act. Although the no-action alternative may result in the least immediate disturbance of natural resources, it does result in increased risk to firefighters in comparison with the other two alternatives and it does not provide opportunities for maintenance of fire-dependent vegetation communities. Alternative 3 more closely meets the criteria of §101

than does the no-action alternative but it also foregoes opportunities for maintenance of fire-dependent vegetation communities.

Table 2.1: The Degree to Which Each Alternative Meets Objectives

Objective	Alt. 1 - No- Action	Alt. 2 – AMR and Integrated Fuels Management	Alt. 3 – AMR and Non- fire Fuels Management
Ensure that safety to firefighters and the public is the highest priority on every fire management action.	1. There will not be a proactive fuels management program. 2. Implementing LCES, reviewing 10 Standard Firefighting Orders and 18 Watch Out Situations, using temporary closures, and increasing public awareness would increase public and firefighter safety during suppression of wildland fires.	1. Integrated fuels management (prescribed fire, mechanical removal of hazardous fuels) would decrease danger to visitors, park neighbors, park facilities, and employees by reducing the likelihood of more intense wildland fires. 2. Noted management controls would be implemented during all fire management actions (wildland fire suppression and prescribed fire operations).	1. Mechanical reduction of hazardous fuels would decrease danger to visitors, park neighbors, park facilities, and employees by reducing the likelihood of more intense wildland fires, though the inability to use prescribed fire would make reduction of hazardous fuels less effective and generally smaller in scale than Alt. 2. 2. Same as Alt 1.
Manage fire cooperatively with adjacent agencies and landowners.	1. Suppression operations would be conducted cooperatively with other agencies. 2. Adjacent agencies (BLM primarily) would continue to manage fuels and vegetation adjacent to NPS lands independently of the monument.	1. All fire management activities would be coordinated with or conducted cooperatively with other agencies and landowners. 2. Fuels management practices could be coordinated with adjacent agencies.	1. Same as Alt 2. 2. Same as Alt 2 excluding prescribed fire.
Manage fire as a process while meeting resource protection goals and resource management objectives.	1. The inability to use prescribed fire would not meet the objective of managing fire as a process. 2. The inability to use mechanical treatments would not meet the objective of resource protection and management goals.	1. The ability to use prescribed fire to mimic the effects of natural ignitions effectively manages fire as a process. It achieves resource management objectives of maintaining long-term diversity in fire dependent communities. 2. Hazard fuel reduction contributes somewhat to achieving the objective by reducing the possibility of more intense wildland fires that may have effects outside the range of historic variability.	1. Same as Alt 1. 2. Same as Alt 2.

Objective	Alt. 1 - No- Action	Alt. 2 – AMR and Integrated Fuels Management	Alt. 3 – AMR and Non- fire Fuels Management
Suppress all wildland fires regardless of ignition source to protect the public, private property, and natural, cultural, and historic resources of the unit, utilizing tactics commensurate with values at risk.	1. Suppression of wildland fires would be employed to protect private property, NPS facilities, and natural, cultural, and historic resources from wildland fire. 2. Resources may be more vulnerable to fire over time as natural fuel loadings increase in fuels and vegetation trends towards older even-aged stands.	1. Same as Alt 1. 2. Integrated management of hazardous fuels, using prescribed fire and mechanical reduction, along with prescribed fire for other resource management objectives would reduce both the likelihood and intensity of wildland fires thus decreasing the potential risk to facilities, sensitive natural resources and cultural resources from wildland fire.	1. Same as Alt 1. 2. Mechanical reduction of fuels would reduce both the likelihood and intensity of wildland fires thus decreasing the potential risk to facilities, sensitive natural resources and cultural resources from wildland fire. Without the use of prescribed fire, fuels treatments would not be as effective. Some resources may be more vulnerable to fire as wildland fuels increase.
Apply fuel management practices to reduce fuel accumulations that threaten park resources and neighboring lands.	1. No prescribed fire. 2. No mechanical treatment.	1. Prescribed fire would be used to reduce hazardous fuels and would likely be applied on a larger scale than mechanical treatments having a greater beneficial reduction of hazardous fuels park-wide. 2. Mechanical treatment would be used to reduce hazardous fuels.	1. Same as Alt 1. 2. Mechanical treatment of fuels in selected areas close to identified developments would take place. Burning hand-piled refuse from hazard fuels treatments would be allowed.

Table 2.2: Summary Comparison of Alternatives

	Alt. 1 – No- Action	Alt. 2 – AMR and Integrated Fuels Management.	Alt. 3 – AMR and Non- fire Fuels Management.
Wildland fire management	Continued suppression of all wildland fires.	The full range of suppression strategies would be available to fire managers.	Same as Alt 2.
Hazardous fuels management	Hazardous fuels would not be managed.	Prescribed fire and mechanical treatments would be used individually or in combination to reduce hazardous fuels and provide defensible space near high value resources. Treatment of hazardous fuels would reduce intensity of any wildland fire in treated areas.	Mechanical removal would be used to reduce hazardous fuels and provide defensible space near high value resources. Burning of debris would be allowed. Mechanical reduction of hazardous fuels would reduce intensity of any wildland fire in treated areas. Prescribed fire would NOT be used as a stand alone treatment.
Prescribed Fire (Maintenance of fire dependent vegetation communities)	Prescribed fire would not be used as a tool for maintenance of fire dependent vegetation communities. Suppression of all wildland fires would not contribute to maintenance of fire dependent vegetation communities.	Prescribed fire may be used in selected locations to maintain or restore fire dependent vegetation communities. Mechanical reduction of hazardous fuels may reduce the potential for high intensity fire and attendant abnormal fire effects, but would otherwise not contribute to maintenance of fire dependent vegetation communities. Prescribed fire may be used to meet specific resource management objectives.	Mechanical reduction of hazardous fuels may reduce the potential for high intensity fire and attendant abnormal fire effects, but would otherwise not contribute to maintenance of fire dependent vegetation communities. Prescribed fire would NOT be used as a tool for maintenance of fire dependent ecosystems.

Table 2.3: Summary Comparison of Alternatives and Impacts

Impact Topic	Alt. 1 – No- Action	Alt. 2 – AMR and Integrated Fuels Management.	Alt. 3 – AMR and Non- fire Fuels Management.
Firefighter and Public Safety	Direct adverse impacts of fire suppression would be localized, short-term, and minor to moderate. Indirect adverse impacts would be localized, minor, and short-term to long-term. Cumulative impacts are minor to moderate.	Direct adverse impacts of appropriate management response to wildland fire, prescribed burning, and mechanical fuels reductions would be localized, short-term, and minor. Indirect adverse impacts would be localized, minor, and short-term to long-term. Cumulative impacts are minor.	Direct adverse impacts of appropriate management response to wildland fire and mechanical fuels reductions would be localized, short-term, and minor. Indirect adverse impacts would be localized, minor, and short-term to long-term. Cumulative impacts are minor.
Geology and Soils	Direct and indirect effects of fire suppression would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of geology and soils.	Direct and indirect of appropriate management response to wildland fire, prescribed burning, and mechanical fuels reductions would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of geology and soils.	Direct and indirect effects of appropriate management response to wildland fire and mechanical fuels reductions would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of geology and soils.
Air Quality	Direct and indirect adverse impacts of fire suppression would be short-term and minor on a local scale and nearly negligible on a regional scale. Cumulative effects would be localized and minor. This alternative would not result in impairment of air quality.	Direct and indirect adverse impacts of wildland fire, prescribed burning, and mechanical fuels reductions would be short-term and minor on a local scale and nearly negligible on a regional scale. Cumulative effects would be localized and minor. This alternative would not result in impairment of air quality.	Direct and indirect adverse impacts of wildland fire and mechanical fuels reductions would be short-term and minor on a local scale and nearly negligible on a regional scale. Cumulative effects would be localized and minor. This alternative would not result in impairment of air quality.
Water Resources	The adverse direct impacts of fire suppression would be localized, short-term, and negligible. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and mi-	The adverse direct impacts of wildland fire, prescribed burning, and mechanical fuels reductions would be localized, short-term, and negligible. Indirect effects would be adverse, localized, short-term, and minor. Cu-	The adverse direct impacts of wildland fire and mechanical fuels reductions would be localized, short-term, and negligible. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and mi-

Impact Topic	Alt. 1 – No- Action	Alt. 2 – AMR and Integrated Fuels Management.	Alt. 3 – AMR and Non- fire Fuels Management.
	nor. This alternative would not result in impairment of water resources.	mulative effects would be localized and minor. This alternative would not result in impairment of water resources.	nor. This alternative would not result in impairment of water resources.
Wetlands	The direct impacts of fire suppression would be localized, short-term, and negligible. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of wetlands.	The adverse direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical fuels reductions would be localized, short-term, and negligible to minor. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of wetlands.	The adverse direct impacts of appropriate management response to wildland fire and mechanical fuels reductions would be localized, short-term, and negligible to minor. Indirect effects would be adverse, localized, short-term, and minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of wetlands.
Vegetation	The direct impacts of fire suppression would be adverse, localized, short-term, and minor. Indirect effects would be adverse, localized, short-term, and negligible. Cumulative effects would be localized and negligible to minor. Over a period of years, fire exclusion in fire-dependent communities would be moderately adverse. This alternative would not result in impairment of vegetation.	The direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical fuels reductions would be adverse and beneficial localized, short-term, and minor. Indirect effects would be beneficial, localized, long-term, and minor to moderate. Cumulative effects would be localized, and minor to moderate, and beneficial in an ecological context. This alternative would not result in impairment of vegetation.	The direct impacts of appropriate management response to wildland fire and mechanical fuels reductions would be adverse and beneficial, localized, short-term, and minor. Indirect effects would be adverse to beneficial, localized, short-term, minor. Cumulative effects would be localized and minor. Over a period of years, fire exclusion in fire-dependent communities would be moderately adverse. This alternative would not result in impairment of vegetation.

Impact Topic	Alt. 1 – No- Action	Alt. 2 – AMR and Integrated Fuels Management.	Alt. 3 – AMR and Non- fire Fuels Management.
Wildlife	The direct impacts of fire suppression would be adverse, localized, short-term, and minor. Indirect effects would be adverse, localized, short-term to long-term, and minor to moderate. Cumulative effects would be localized and negligible to minor. This alternative would not result in impairment of wildlife.	The direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical fuels reductions would be adverse, localized, short-term, and minor. Indirect effects would be localized and minor, but vary in duration from short-tern to long-term, and in type from adverse to beneficial depending on the species involved. Cumulative effects would be localized, minor, and adverse to beneficial. This alternative would not result in impairment of wildlife.	The direct impacts of appropriate management response to wildland fire and mechanical fuels reductions would be adverse, localized, short-term, and negligible to minor. Indirect effects would be adverse, localized, short-term, and negligible to minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of wildlife.
Visitor Experience and Park Operations	The direct and indirect impacts of fire suppression would be adverse and beneficial, localized, short-term, and minor. Cumulative effects would be localized and minor.	The direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical fuels reductions would be adverse and beneficial, localized, short-term, and negligible to minor. Indirect effects would be localized, short-term, minor, and adverse to beneficial. Cumulative effects would be localized, negligible to minor, and adverse to beneficial.	The direct impacts of appropriate management response to wildland fire and mechanical fuels reductions would be adverse, localized, short-term, and negligible to minor. Indirect effects would be adverse, localized, short-term, and negligible to minor. Cumulative effects would be localized and minor.
Cultural Resources: Archeological Resources and Historic Structures	The direct impacts of fire suppression would be adverse, localized, short-term, and negligible to minor. Indirect impacts would be adverse to beneficial, localized, short-term, minor. Cumulative effects would be localized and minor. This alternative would not result in impairment of cultural resources.	The direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical fuels reductions would be adverse, localized, short-term, and minor. Indirect effects would be localized, short-term to long-term, negligible to minor, and adverse or beneficial. Cumulative effects would be adverse to beneficial, localized, minor. This alternative would not result	The direct impacts of appropriate management response to wildland fire and mechanical fuels reductions would be adverse, localized, short-term, and minor. The short-term indirect effects would be adverse, localized and minor. Long-term indirect impacts would be beneficial. Cumulative effects would be localized, minor, and adverse or beneficial. This alternative would not result in impairment of cultural resources.

Impact Topic	Alt. 1 – No- Action	Alt. 2 – AMR and Integrated Fuels Management.	Alt. 3 – AMR and Non- fire Fuels Management.
		in impairment of cultural resources.	
Paleontological Resources	The direct impacts of fire suppression would be localized and negligible. Indirect impacts would be localized and negligible. Cumulative impacts would be localized and negligible to minor. This alternative would not result in impairment of paleontological resources.	The direct impacts of appropriate management response to wildland fire, prescribed burning, and mechanical fuels reductions would be localized and negligible. Indirect effects would be localized and negligible. Cumulative effects would be adverse, localized and negligible to minor. This alternative would not result in impairment of paleontological resources.	The direct and indirect impacts of appropriate management response to wildland fire and mechanical fuels reductions would be localized and negligible. Cumulative effects would be localized and negligible to minor. This alternative would not result in impairment of paleontological resources.

Chapter 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Methodology for Assessing Impacts

Applicable and available information on known natural and cultural resources was compiled. Alternatives were evaluated for their effects on the resources and values determined during the scoping process. The impact analyses were based on professional judgment using information provided by National Park Service staff, relevant references and technical literature citations and subject matter experts. For each impact topic, the analysis includes a brief description of the affected environment and an evaluation of effects. Potential impacts are described in terms of type (are the effects beneficial or adverse?), context (are the effects site-specific, local or even regional?), duration (are the effects short-term or long-term?), and intensity (are the effects negligible, minor, moderate or major, or would the effects constitute impairment of the Fossil Butte National Monument's resources and values?). Because definitions of intensity (negligible, minor, moderate or major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this environmental assessment/assessment of effect.

Direct, indirect, and cumulative effects are discussed in each impact topic. Predictions about direct and indirect effects are based on previous studies, monitoring information, wildland fires effects that have occurred in Fossil Butte National Monument or similar vegetation communities, and the expertise and judgment of resource management specialists.

When appropriate, mitigation measures that may be employed to offset or minimize potential adverse impacts have been identified.

Definitions of intensity levels varied by impact topic but the following definitions apply for all impact topics.

Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse: A change that moves the resource away from a desired condition or detracts from its appearance or condition.

Direct: An effect that is caused by an action and occurs in the same time and place.

Indirect: An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.

Short-term: An effect that within a short period of time would no longer be detectable as the resource is returned to its predisturbance condition or appearance. Short-term im-

pacts, depending on impact topic, may range from a few hours up to ten years (see table below).

Long-term: A change in a resource or its condition that does not return the resource to predisturbance condition or appearance, and for all practical purposes is considered permanent.

Intensity of Effects Defined

The following table defines impact thresholds, by impact topic, for each level of intensity included in this assessment.

Table 3.1. Impact Threshold Definitions

Impact Threshold	Firefighter and Public Safety
Negligible	An action that could cause a change in level of risk to human safety, but the change would be so small that it would not be of any measurable or perceptible effect.
Minor	An action that could cause a change in risk level, but the change would be small and have a localized effect. Mitigation would be a standard procedure and highly effective in minimizing risk.
Moderate	An action that would cause change to levels of risk; however, mitigation to offset adverse effects would generally be of moderate complexity and would be effective.
Major	An action that would cause a severe change or exceptional benefit to human safety related values. The change would have a substantial and possible permanent effect, and mitigation to offset adverse effects is not assured.
Duration of Impact	Short-term would refer to the duration of a fire management incident. Long-term refers to duration extending beyond the specific incident.
Impact Threshold	**Geology and Soils**
Negligible	Impacts to soils and geologic features would not be measurable or of any perceptible consequence.
Minor	Changes to character of soils and geologic features are detectable but small, localized and of little consequence. Any mitigation needed to offset adverse effects would be standard, uncomplicated and effective.
Moderate	Changes to character of soils and geologic features would be readily apparent and of consequence. Changes may be evident over large portion of monument area. Mitigation measures to offset adverse effects would probably be necessary and likely successful.
Major	Impacts to characteristics of soils and geologic features would be severe or of exceptional benefit over a wide area. Mitigation to offset adverse effects would be needed, but its success not assured.
Duration of Impact	Short-term refers to durations of less than 5 years. Long-term refers to durations in excess of 5 years.
Impact Threshold	**Air Quality**
Negligible	Impact would be barely detectable and not measurable; if detected, would not be of any perceptible consequence.
Minor	Impact measurable but localized and of little consequence. No mitigation measures

	would be necessary.
Moderate	Changes in air quality would have consequences to sensitive receptors, but effects would remain local. Mitigation measures necessary and likely effective.
Major	Changes in air quality would have substantial consequences to sensitive receptors. Mitigation measures necessary and success of measures not assured.
Duration of Impact	Short-term would refer to hours or days; i.e., the duration of the fire management incident. Long-term would refer to that substantially beyond the duration of the incident or action.
Impact Threshold	**Water Resources**
Negligible	Neither water quality nor hydrology would be affected, or changes would be either non-detectable or if detected, would have effects that would be considered slight.
Minor	Changes in water quality or hydrology would be measurable, although the changes would be small, would likely be localized. No mitigation measure associated with water quality or hydrology would be necessary.
Moderate	Changes in water quality or hydrology would be measurable but would be relatively localized. Mitigation measures associated with water quality or hydrology would be necessary and the measures would likely succeed.
Major	Changes in water quality or hydrology would be readily measurable, would have substantial consequences and would be noticed on a regional scale. Mitigation measures would be necessary and their success would not be guaranteed.
Duration of Impact	Short-term would refer to recovery in less than 5 years. Long-term would refer to recovery, following treatment, requiring longer than 5 years.
Impact Threshold	**Wetlands**
Negligible	Impacts would be so small that they would not be of measurable or perceptible consequence. No substantial change to wetland function.
Minor	Changes to wetland function would be small, localized and of little consequence. Any adverse effects to function can be effectively mitigated.
Moderate	Changes to wetland function would be of consequence. Mitigation to offset adverse effects extensive but likely successful.
Major	Changes to wetland function would be noticeable and result in severely adverse or beneficial impacts. Loss of ecological function may be permanent. Mitigation to offset adverse effects is required and extensive, and success would not be assured.
Duration of Impact	Short-term refers to a period of 1-3 years. Long-term refers to a period longer than 3 years.
Impact Threshold	**Vegetation**
Negligible	The change in native vegetation communities would be so small that it would not be of any measurable or perceptible consequence.
Minor	Changes in populations of native vegetation would be small, localized and of little consequence. Response to fire and/or other treatments would be within the range of normal fire effects. Any adverse effects can be effectively mitigated.
Moderate	A large segment of one or more species populations would exhibit effects that are of consequence, but would be relatively localized. Response to fire and/or other treatments would be within the normal expected range of normal fire effects. Mitigation could be extensive, but likely effective.
Major	Severely adverse, and possibly permanent effects to native plant communities. Response to fire and/or other treatments would be outside the normal range of expected fire effects. Mitigation to offset adverse effects may be required and extensive, and success would not be assured.

Duration of Impact	Short-term refers to a period of less than 10 years. Long-term refers to a period longer than 10 years.
Impact Threshold	**Wildlife**
Negligible	The change in wildlife populations and/or habitats would be so small that it would not be of any measurable to perceptible consequence.
Minor	Changes in wildlife populations or habitats would be small, localized and of little consequence. Response to fire and/or other treatments would be within the range of normal fire effects. Any adverse effects can be effectively mitigated.
Moderate	Changes in wildlife populations or habitats would be of consequence, but would be relatively localized. Response to fire and/or other treatments would be within the normal expected range of normal fire effects. Mitigation to offset adverse effects to native species extensive but likely successful.
Major	Severely adverse and possibly permanent effects to native wildlife populations or habitats. Response to fire and/or other treatments would be outside the normal range of expected fire effects. Mitigation to offset adverse effects may be required and extensive, and success would not be assured.
Duration of Impact	Short-term refers to a period of less than 10 years. Long-term refers to a period longer than 10 years.
Impact Threshold	**Visitor Experience and Park Operations**
Negligible	An action that could cause a change in visitors' activities and/or aesthetic resource values, but the change would be so small that it would not be of any measurable or perceptible effect. Few visitors would be affected.
Minor	An action that would affect some visitors and cause a change in visitors' activities or aesthetic resources, but the change would be small and localized. Mitigation would not be necessary.
Moderate	An action that would cause a substantial, measurable change in activities available to many park visitors. Mitigation to offset adverse effects would be necessary and effective. Aesthetic resources would not be substantially degraded.
Major	An action that would cause a severe change or exceptional benefit to the activities of most park visitors. The change would have substantial and possibly permanent effects on visitor use. Aesthetic resources would be substantially degraded. Mitigation to offset adverse effects would be needed and success would not be assured.
Duration of Impact	Short-term refers to a duration of days to a few months. Long-term refers to a duration in excess of a year.
Impact Threshold	**Cultural Resources: Archeological Resources and Historic Structures**
Negligible	Impacts to archeological resources or historic properties, either beneficial or adverse, which are at the lowest levels of detection, barely perceptible and not measurable. For purposes of Section 106, the determination of effect would be *no adverse effect*.
Minor	The impact affects an archaeological or historic site or feature with little data potential. The historic context of the affected site(s) would be local. The impact would not affect the contributing elements of a structure eligible for, or listed on the National Register of Historic Places. For purposes of Section 106, the determination of effect would be *no adverse effect*.
Moderate	The impact affects an archaeological or historic site with modest data potential. The historic context of the affected site(s) would be state. For a National Register eligible site, the adverse impact would affect some of the contributing elements of the site but would not diminish the integrity of the resource and jeopardize its National Register eligibility. For purposes of Section 106, the determination of effect would be *adverse effect*.

Major	The impact affects an archaeological or historic site with high data potential. The historic context of the affected site(s) would be national. For a National Register eligible or listed site, the impact would affect the contributing elements of the site by diminishing the integrity to the extent that it is no longer eligible for listing on the National Register. For purposes of Section 106, the determination of effect would be *adverse effect*.
Duration of Impact	Short-term refers to a transitory effect, one that largely disappears over a period of days or months. The duration of long-term effects is essentially permanent.
Impact Threshold	**Paleontological Resources**
Negligible	Impacts to paleontological resources would not be measurable or of any perceptible consequence.
Minor	Changes to character of fossil-bearing strata are detectable but small, localized and of little consequence. Any mitigation needed to offset adverse effects would be standard, uncomplicated, and effective.
Moderate	Changes to character of paleontological resources are readily apparent and of consequence. Changes may be evident over large portion of the fossil-bearing strata. Mitigation measures to offset adverse effects would probably be necessary and likely successful.
Major	Impacts to paleontological resources are severe over a wide area. Mitigation to offset adverse effects would be needed, but its success would not be assured.
Duration of Impact	Short-term refers to durations of less than 5 years. Long-term refers to durations in excess of 5 years.

Cumulative Effects Methodology

From CEQ regulations (1508.7), a "cumulative effect" is the effect on the environment that results from the incremental effect of the action(s) when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such action.

Cumulative impacts will be determined by combining the impacts of each alternative with other past, present, and reasonably foreseeable future actions. Therefore, it is necessary to identify other ongoing or reasonably foreseeable future projects on NPS lands of Fossil Butte National Monument and, if applicable, the surrounding area.

Other Past, Ongoing, and Proposed Projects in the Area

Several other activities and projects which may contribute to cumulative impacts have been identified in the surrounding environs.

- Grazing by domestic livestock occurred in Fossil Butte National Monument until 1989; it continues on private and BLM lands surrounding the monument.
- Mule deer, elk, pronghorn antelope, moose and grouse, utilize habitats in and adjacent to the monument. Hunting continues outside the monument.
- There are several commercial fossil quarries within 5 miles of the monument.
- The Pacificorp Naughton Power plant and the Pittsburgh and Midway open pit coal mine are within 10 miles of the monument.

- Williams Field Service has a natural gas processing facility approximately 25 miles downwind of Fossil Butte National Monument.
- British Petroleum and Chevron/Texaco operate sulfur loadout terminals approximately 9 miles south of Kemmerer, Wyoming, on U.S. Highway 189.
- Exxon operates a large gas processing plant approximately 35 miles east of the monument.
- Additional energy developments are more distant from the monument.
- Mobile sources of pollution in the area include railroads, motor vehicles and ranch equipment.
- Prescribed burning and mechanical vegetation manipulation projects occur on adjacent BLM land.
- Two ranchers conduct livestock drives through the park in the spring and fall; these drives are expected to continue.

No additional facility construction at Fossil Butte National Monument is anticipated in the foreseeable future.

Compliance with Section 106, National Historic Preservation Act

In accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 of the NHPA (36 CFR Part 800, *Protection of Historic Properties*), impacts to cultural resources and the cultural landscape will be identified and evaluated by (1) determining the area of potential effects, (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National Register of Historic Places, (3) applying the criteria of adverse effect to affected cultural resources which are unevaluated, listed in, or eligible to be listed in the National Register, and (4) considering ways to avoid, minimize, or mitigate adverse effects.

CEQ regulations and the NPS's *Conservation Planning, Environmental Impact Analysis and Decision-making* (Director's Order 12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, for example, reducing the intensity of an impact from major to moderate or minor. However, any reduction in intensity of impact resulting from mitigation is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced.

Under the Advisory Council's regulations, a determination of either *adverse effect* or *no adverse effect* also must be made for affected National Register-eligible cultural resources. An *adverse effect* occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register, e.g. diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by an alternative that would occur later in time, be farther removed

in distance or be cumulative (36 CFR Part 800.5, *Assessment of Adverse Effects*). A determination of *no adverse effect* means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the National Register.

A Section 106 summary will be included for the preferred alternative in the impact analysis section for cultural resources. The Section 106 summary is intended to meet the requirements of Section 106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources based upon the criterion of effect and criteria of adverse effect found in the Advisory Council's regulations.

Impairment Methodology

National Park Service's *Management Policies* (2001) require analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the National Park System, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within a park, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park; or
- identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. A determination on impairment is made in the Environmental Consequences section by resource topic.

FIREFIGHTER AND PUBLIC SAFETY

Affected Environment. There are several small communities near Fossil Butte National Monument – the town of Kemmerer (pop. about 2,700 people) and the small community of Diamondville (pop. about 700 people). Both are about 10 miles east of the monument. There are about 10 small commercial fossil operations on State of Wyoming and private lands within a few miles of Fossil Butte NM.

Most of the lands adjacent to Fossil Butte NM are federal lands administered by the Bureau of Land Management. Additional information about land ownership is available through Lincoln County.

The Kemmerer Volunteer Fire Department and a Bridger-Teton National Forest engine stationed in Kemmerer would likely be the first responders to wildland fire in Fossil Butte NM under existing mutual aid agreements. These engines could generally respond within a half hour. Other federal agency firefighting resources are BLM engines in Rock Springs; response may be one to two hours, depending on the location of the engines at the time of dispatch. Although Fossil Butte NM has a wildland engine on site, engine module staffing and qualification standards can not be met at this time. Fossil Butte NM personnel do maintain fire qualifications and would undoubtedly be involved in any wildland or prescribed fire on the monument (operations, law enforcement, resource advisor, information officer, etc.).

Fundamental to the fire management program is an understanding that safety of firefighters and the public is the primary goal in all fire operations. National policy reviews, agency and interagency policy documents, and operating procedures and guidelines all emphasize common rules of engagement, SOP's, risk management and qualifications. The implementation of any of the proposed alternatives will follow and incorporate these polices designed to affect a safe fire management program. These include the policy documents referenced in Chapter 1, under Relevant Laws, Policies and Planning Documents (Federal Policy Review, Implementation Guide), as well as the following; Interagency Standards for Fire and Fire Aviation Operations, Fireline Handbook, Incident Response Pocket Guide, and the NWGC Wildland and Prescribed Fire Qualifications System.

Wildland fire management and fuels management programs have some level of inherent risk to both firefighters and the public. Risks are generally greater when reacting to an unplanned event, such as a wildland fire than when managing a planned event (prescribed fire or mechanical fuels treatment project). Planned events proposed under Alternatives 2 and 3 of this plan will either directly or indirectly meet the objectives of wildland hazardous fuels reduction. Reduced fuel loading will directly affect the scale and intensity of any subsequent wildland fire in the treated area. The resultant change in fire behavior would thereby reduce risks to firefighters and the public in such a scenario.

Potential risks to firefighter and public safety can be reduced by the following additional mitigation measures such as, but not limited to:

- Adhering to the 10 Standard Firefighting Orders (the 10 Standard Orders are basic safety principles in wildland firefighting)
- Being aware of potential Watch Out Situations (the 18 "watch out" situations identify conditions under which fire fatalities have occurred)
- Establishing LCES (LCES is an acronym for **L**ookouts, **C**ommunications, **E**scape Routes, and **S**afety Zones)
- Utilizing a Risk Management process
- Wearing all appropriate personal protective equipment
- Utilizing the Job Hazard Analysis process
- Imposing temporary closures
- Distributing informational fliers to park staff and visitors, including information on temporary closures

Methodology. Information on the number of acres treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and fire return intervals. Available resource information from the monument, the Northern Colorado Plateau Network, and cooperating agencies was also considered in the analysis. Intensity of effects is defined above in Table 3.1.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Firefighters and the public are protected from injury or undue threat from wildland fire management, prescribed burning, or fuels management projects.

Source – NPS *Management Policies*, D.O. 18, RM-18

Impacts of Alternative 1: No- Action

Impact Analysis: Suppression activities would continue on an average of less than one fire in several typical 5-year periods, primarily in NFFL fuel models 2 and 5. Fire behavior is characterized by moderate rates of spread in sagebrush and limber pine communities with flame lengths ranging up to about 7 feet. Fire in aspen stands would exhibit less intense fire behavior. Most fire suppression efforts would be confined to a few hours to a few days duration.

The direct adverse effect of the no-action alternative is exposure of fire management personnel to the hazards typically associated with wildland fire suppression: burns, cuts and abrasions from equipment, falls, smoke inhalation, and other injuries. Indirect adverse effects include long-term effects of smoke inhalation. With no fuel management

practices incorporated in the program there would be no opportunity to reduce expected fire behavior on lands within Fossil Butte NM. Responding fire personnel would be at greater risk to typical hazards in such an environment. Exposure to direct and indirect effects would be greatest with this alternative.

Direct and indirect adverse effects to firefighters would be mitigated by application of the Ten Standard Firefighting Orders, LCES, and other risk mitigation actions such as safety briefings. Temporary closures would be used to reduce exposure to park visitors and neighbors.

The communities of Kemmerer, Diamondville, and Frontier have so many fuel discontinuities (e.g. man-made barriers to fire such as roads) between them and Fossil Butte National Monument that there is very low risk for a wildland fire originating in the monument to threaten the communities.

The direct and indirect adverse impacts to firefighters and the public would be localized, short-term to long-term, and negligible to minor.

Cumulative Effects: Firefighters, visitors, and park neighbors are exposed regularly to hazards associated with vehicle use and other work activities. Cumulative impacts to firefighter and public safety under the no-action alternative include those that could result from the park's actions, those resulting from the continued fire policies and practices on adjacent Bureau of Land Management lands, and other actions within Fossil Butte NM that involve health and safety issues. The cumulative effects on wildland firefighter and public safety are localized and minor.

Conclusion: Negligible to minor short-term adverse effects to wildland firefighter and public safety would occur under the no action alternative. Adverse effects to firefighter and public safety are expected to increase as fire return intervals are missed (due to fire exclusion through suppression efforts), resulting in heavier fuel loads and more extreme fire behavior. The direct and indirect adverse impacts to firefighters and the public under the no-action alternative would be localized, short-term to long-term, and minor.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management (preferred alternative)

Impact Analysis:

The preferred alternative would reduce risks to wildland firefighters and visitors, a beneficial impact, by allowing use of an appropriate management response to wildland fires. This response may include selecting control lines along natural or man-made barriers which reduces the exposure of firefighters in unburned fuels adjacent to a fire perimeter. Additional exposure for firefighters and visitors is created by prescribed burning and mechanical fuels reduction on the short-term. The long-term risks, however, are reduced as fuel loads are lowered, prescribed burns are conducted under favorable weather and fuel conditions, and safe access/egress and defensible space is created

around high visitor use areas as a result of fuel reduction projects. Planned fuel treatments allow for the implementation of management controls to identify and mitigate risks to both park staff and the public. Therefore the overall risk is lower than the no-action alternative.

The direct adverse effect of the preferred alternative is exposure of fire management personnel to the hazards typically associated with wildland fire suppression and prescribed burning: burns, cuts and abrasions from equipment, falls, smoke inhalation, and other injuries. Indirect adverse effects include the long-term effects of smoke inhalation. Exposure to direct and indirect effects would be less with this alternative than the no-action alternative but greater than Alternative 3 because of the inclusion of prescribed burning.

Direct and indirect adverse effects to firefighters would be mitigated by application of the Ten Standard Firefighting Orders, LCES, and other risk mitigation actions. Temporary closures would be used to reduce exposure to park visitors and neighbors. The risks associated with prescribed burning would be further mitigated by ensuring the burns are conducted within the approved prescription. Mechanical hazard fuel reduction activities would employ standard safety equipment and protocols (e.g. utilization of appropriate personal protective equipment, conducting a Job Hazard Analysis, completing After Action Reviews).

The communities of Kemmerer, Diamondville, and Frontier have so many fuel discontinuities (e.g., man-made barriers to fire such as roads) between them and Fossil Butte NM that there is very low risk for a wildland or prescribed fire originating in the monument to threaten the communities.

With mitigation measures in place, the adverse impacts of the preferred alternative would be short-term, localized, and minor. Beneficial effects of a fuels management program will be realized over time.

Cumulative Effects: Firefighters, visitors, and park neighbors are exposed regularly to hazards associated with vehicle use and other work activities. Cumulative effects of the preferred alternative include a slightly longer duration of exposure to hazards associated with fire suppression and prescribed burning activities. The potential for exposure to smoke and particulate matter is slightly elevated with inclusion of prescribed burning in this alternative, but such exposure is readily mitigated by ignition patterns and minimizing the time individual firefighters spend in smoky conditions. Cumulative impacts to firefighter and public safety under Alternative 2 would be less than under Alternative 1, since the additional fuels reduction over time would reduce the potential for widespread or extreme fire behavior. The cumulative effects on wildland firefighter and public safety are localized and minor.

Conclusion: The direct and indirect adverse impacts to firefighters and the public under the preferred alternative would be localized, short-term to long-term, and minor. Exposure to direct and indirect effects of fire suppression would be less than Alternative 1. Short-term exposure to direct and indirect effects of fuel reduction (prescribed burning, manual fuel reduction) would be greater under this alternative than the no-action alternative, and slightly greater than Alternative 3 because of the inclusion of prescribed burning. Overall the total risks and associated impacts to firefighter and public safety would be the least with this alternative because of the adoption of an integrated fuel management program (prescribed burning and mechanical fuel reduction) designed to reduce fuel loads and reduce fire intensity.

Impacts of Alternative 3: Appropriate Management Response and Non- fire Fuels Management

Impact Analysis: The direct and indirect adverse impacts to wildland firefighter and public safety with Alternative 3 are intermediate because risk on wildland fires is reduced by using an appropriate management response and there would be no prescribed burning. Exposure to direct and indirect adverse effects would be least with this alternative, however accumulated risk is greater than Alternative 2 as fuel reduction activities would be more limited in scale and effectiveness. Associated effects on fire behavior and intensity would likewise be limited. The mitigations for risk would be similar to those described above under the preferred alternative. The risks to adjacent communities would be similar to those identified in Alternative 1 and 2. Overall, the impacts of Alternative 3 to firefighters and the public would be short-term, localized, and minor.

Cumulative Effects: Firefighters, visitors, and park neighbors are exposed regularly to hazards associated with vehicle use and other work activities. Cumulative effects of Alternative 3 are similar to, but slightly less than, the preferred alternative. Cumulative impacts would be less than under Alternative 1, since the additional fuels reduction over time would reduce the potential for widespread or extreme wildland fires. The cumulative effects on wildland firefighter and public safety are localized and minor.

Conclusion: The direct and indirect adverse impacts to firefighters and the public under the preferred alternative would be localized, short-term to long-term, and minor. Exposure to direct and indirect effects of fire suppression would be less than Alternative 1. Short-term exposure to direct and indirect effects of fuel reduction (manual fuel reduction) would be greater under this alternative than the no-action alternative.

GEOLOGY AND SOILS

Affected Environment. The major geologic formations of interest at Fossil Butte National Monument are the Wasatch and Green River formations. The Wasatch formation displays the red, purple, and yellow badlands. The Green River formation, with buff to white colors, is situated above the Wasatch formation and contains the main fossil fish deposits. The outcrops of these formations are very sparsely vegetated.

The Natural Resource Conservation Service (formerly Soil Conservation Service) has completed an "Order 3" survey of Fossil Butte National Monument (Glenn 1974, cited in Kyte 2001). An Order 3 soil survey identifies soil series. The following are the major soil series in Fossil Butte NM.

Cundick Series: Soils are generally well-drained with slow permeability. The surface layer is a reddish brown clay ranging from 6 to 20 inches deep over Wasatch shale. Elevation is 7,000 to 8,000 feet. Typical native vegetation on these soils includes low sagebrush, rabbitbrush, and native grasses.

Fossilon Series: Soils are generally well-drained with moderately slow permeability. The surface layer is a pale brown clay loam ranging from 6 to 20 inches deep over a marlstone member of the Green River formation. Elevation is 7,200 to 8,000 feet. Typical native vegetation on these soils includes low sagebrush and native grasses.

Gunsone Series: Soils are generally well-drained with slow permeability. The surface layer is a light reddish brown clay ranging from 9 to 60 inches deep. Elevation is 6,600 to 7,500 feet. Typical native vegetation on these soils includes big sagebrush, winterfat, and native grasses.

Moyerson Series: Soils are generally well-drained with slow permeability. The surface layer is a pale brown clay ranging from 6 to 20 inches deep over Wasatch shale. Elevation is 6,600 to 7,400 feet. Typical native vegetation on these soils includes winterfat and native grasses.

Prow Series: Soils are generally well-drained with moderate permeability. The surface layer is a light brownish gray clay loam ranging from 6 to 20 inches deep over soft marlstone of the Green River formation. Elevation is 7,200 to 8,000 feet. Typical native vegetation on these soils includes big sagebrush, serviceberry, bitterbrush, rabbitbrush, and native grasses.

Redmanson Series: Soils are generally well-drained with moderate permeability. The surface layer is a grayish brown loam ranging from 19 to 60 inches deep. Parent materials from the Wasatch and Green River formations are intermingles. Elevation is 7,000 to 8,000 feet. Typical native vegetation on these soils includes big sagebrush, snowberry, serviceberry, aspen, bitterbrush, and native grasses.

Swift Creek Series: Soils are generally well-drained with moderate permeability. The surface layer is a pale brown loam ranging from 40 to 60 inches deep over marlstone and limestone members of the Green River formation. Elevation is 7,000 to 8,000 feet. Typical native vegetation on these soils includes big sagebrush, serviceberry, rabbitbrush, snowberry, and native grasses.

Tisworth, Fine Variant, Series: Soils are generally well-drained with slow permeability. The surface layer is a light brown clay or clay loam ranging from 20 to 60 inches or more deep. Elevation is 6,600 to 7,500 feet. Typical native vegetation on these soils includes greasewood, rabbitbrush, snakeweed, and native grasses.

The report notes that all of these series are used for rangeland, recreation, and wildlife habitat. The erosion hazard for each soil complex that was mapped is discussed in the soil report. Most soils are considered to have a moderate to severe erosion hazard.

There is concern about erosion, particularly in Chicken Creek. Monitoring of Chicken Creek began in 1986 and in 1994 Fossil Butte NM staff began planting willows along the drainage. Several structures to retard the rate of erosion were constructed at various points along Chicken Creek. Stock pond construction also contributed to the erosion of Chicken Creek. The stock ponds were constructed, and their dams breached, prior to establishment of the monument. The dams have all been removed.

Slumping has occurred in many locations scattered throughout the monument. Slumping occurs when clay soils become saturated or the forces of gravity cause weak strata to fail. The Resource Management Plan describes the slumping as a natural phenomena and not of management concern. Cliff areas containing fossils are subject to wind and water erosion and freeze/thaw mechanisms; these also are natural processes.

Wildland fire has various effects on soil properties. Variables that influence these effects include: fire severity (related to the downward heat pulse), residence time of the flaming front, soil moisture, and the amount of organic matter. The direct effects of fire on soil properties may include changes in soil chemistry (e.g., loss of nitrogen), reduction in porosity, and consumption of organic matter. Indirect effects may include an increase in soil temperature and erosion after vegetation layers are removed. Because fuel loading is light with shrub fuel types in the monument, fires in these fuel types have a short residence time and generate only a small downward heat pulse. Fires in the limber pine community should also have a small downward heat pulse since the primary carrier of fire would be grasses and shrubs. Fires within the aspen community would heat the soil somewhat more in localized areas since there is more dead and down woody material.

Methodology. Information on the number of acres treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and fire return intervals. Available resource information from the monument, the Northern Colorado Plateau Network, and cooperating agencies was also considered in the analysis. Intensity of effects is defined above in table 3.1.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Soil stability and fertility are perpetuated. Soil stability and fertility in the long-term are not decreased as a result of fire management programs and practices.

Source – NPS Organic Act, NPS *Management Policies* (2001)

Impacts of Alternative 1: No- Action
Impact Analysis: The effects of wildland fires on soils in Fossil Butte National Monument, particularly given their infrequent occurrence as well as low organic content in local soils, would be well within the range of normal fire effects; i.e. release of soil nitrogen, localized short-term sterilization of soils under heavy fuels, retention of soil structure. Effects outside the range of normal effects, e.g. destruction of soil structure over wide areas, would not be anticipated. Impacts of intense fire on steep slopes may be greater on areas with highly erosive soils, especially if all vegetation is removed. However, many of these areas of highly erosive soils are less vulnerable to fire due to more scarce vegetation. The fire return interval in these areas is also expected to be rather long. Therefore, the impacts of wildland fire on soils would be adverse, minor, short-term, and limited to the area burned. Indirect adverse impacts, such as erosion, would be localized, short-term, and minor.

Regrowth after fire in sagebrush and limber pine communities is expected to be rapid – within the year and no later than the next spring. The response in aspen communities is also expected to be rapid with root suckering providing hundreds to thousands of stems per acre within a year. With such rapid regrowth, the likelihood of erosion problems in Chicken Creek and other drainages is low. The expected erosion impact is localized, short-term, and minor.

Direct adverse impacts to soils from fire suppression operations include surface disturbance from firelines (handline, dozer line) and localized erosion associated with water use. Since only one wildland fire has occurred in the past 20 years, the potential impact of fire suppression in a typical 5-year period is considered minor. Fire suppression efforts on exposed Wasatch and Green River formations are unlikely since the extant vegetation is too sparse to carry fire. Indirect adverse effects could include erosion on firelines, but that potential can be mitigated by not placing firelines on steep slopes or by rehabilitating firelines in those areas.

Direct and indirect adverse effects of fire suppression under the no-action alternative would be localized, short-term, and negligible to minor.

Cumulative Effects: The direct and indirect effects of the no-action alternative on soils and geology would be adverse, localized, short-term, and minor. Grazing, mining, off-road vehicle travel, wildland fire, and erosion on adjacent lands contribute to cumulative effects, though these impacts would be localized and minor. No other projects or programs have been identified within the monument that will contribute to cumulative

effects on soils and geology. Cumulative effects of the no-action alternative on soils and geology are anticipated to be localized and minor.

Conclusion: The direct and indirect effects of the no-action alternative on soils and geology would be adverse, localized, short-term, and minor. Alternative 1 would not produce any major adverse impacts or impairment of soil and geology resources or values whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management (preferred alternative)

Impact Analysis: The effects of wildland fires on soils in Fossil Butte National Monument, particularly given their infrequent occurrence as well as low organic content in local soils, would be well within the range of normal effects. As such, the impacts of wildland fire on soils would be adverse, minor, short-term, and limited to the area burned. Indirect adverse impacts, such as erosion, would be localized, short-term, and minor.

Direct adverse impacts to soils from fire suppression operations include surface disturbance from firelines (handline, dozer line) and localized erosion associated with water use. Since only one wildland fire has occurred in the past 20 years, the potential impact of fire suppression in 10-20 years is considered minor, even though many vegetation communities are nearing the end of their normal fire return intervals. Fire suppression efforts on exposed Wasatch and Green River formations are unlikely since the extant vegetation is too sparse to carry fire. Use of an appropriate management response to wildland fires may result in a slight increase in acres burned. However, the use of existing barriers under this scenario should result in less fireline construction, less ground disturbance, and fewer direct impacts to soils than under the no-action alternative. Implementation of an appropriate management response is therefore a beneficial, localized, and minor impact. Indirect adverse effects could include erosion on firelines, but that potential can be mitigated by not placing firelines on steep slopes or by rehabilitating firelines in those areas.

Prescribed burning in sagebrush communities, particularly with rapid rates of spread, would elevate ground temperatures only a few degrees with negligible to minor direct adverse effects on soils. Planning for such burns can select natural barriers and other mitigation measures to minimize ground disturbance and thus minimize indirect effects such as erosion on firelines. Direct effects of prescribed burning in aspen may include more elevated soil temperatures as the result of consumption of dead and down woody material. Indirect effects may include a slightly increased potential for local erosion. All of these impacts would have occurred multiple times on the landscape prior to the implementation of a fire suppression policy. Given the areas proposed for burning, the likelihood of fire effects within the normal range of variability and the low frequency of

burning, the direct and indirect adverse impacts of prescribed burning on soil characteristics would be localized, minor, and short-term. Some negligible to minor beneficial impact may occur through nutrient recycling.

Regrowth after fire in sagebrush and limber pine communities is expected to be rapid – within the year and no later than the next spring. The response in aspen communities is also expected to be rapid with root suckering providing hundreds to thousands of stems per acre within a year. With such rapid regrowth, the likelihood of erosion problems in Chicken Creek and other drainages is low. The expected erosion impact, while adverse for soils, would be localized, short-term, and minor.

Prescribed burning would generally not be conducted on slopes steeper than 3:1 since the soils on these slopes are more likely to be highly erosive and post-fire erosion may damage the A and B soil horizons. Prescribed fire burn plans would address mitigation measures if burning is proposed on such slopes.

Mechanical treatment of hazardous fuels would involve two to four fuels reduction projects totaling about 45 acres during a typical 5-year period. Chainsaws would be used to remove brush and tress near facilities, visitor use areas, and the historic Haddenham Cabin. Cut material would be piled for later burning or removal. The direct adverse impact on geology and soils would be minor soil surface disturbance from rubber-tired vehicles in portions of the immediate project areas. No measurable indirect adverse impacts on geology and soils are anticipated. The potential direct and indirect adverse impacts attributable to this aspect of the preferred alternative are therefore short-term, localized, and minor. Pile burning would occur in the mechanical fuels treatment areas a year or two following the mechanical treatments during periods when soils were moist and cool. Although there would be increased heating of soils directly below the piles, the adverse impact to soils should be short-term, minor, and localized.

Cumulative Effects: The direct and indirect effects of the preferred alternative on soils and geology would be adverse, localized, short-term, and minor. Grazing, mining, off-road vehicle travel, wildland fire, and erosion on adjacent lands contribute to cumulative effects, though these impacts would be localized and minor. No other projects or programs have been identified within the monument that will contribute to cumulative effects on soils and geology. Cumulative effects of the preferred alternative on soils and geology are anticipated to be localized and minor.

Conclusion: Both the direct and indirect adverse impacts of the preferred alternative on geology and soils would be short-term, localized, and minor. Alternative 2 would not produce any major adverse impacts or impairment of soil and geology resources or values whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 3: Appropriate Management Response and Non- fire Fuels Management

Impact Analysis: Use of an appropriate management response to wildland fires may result in a slight increase in acres burned. However, the use of existing barriers under this scenario should result in less fireline construction and subsequently less ground disturbance. Prescribed fires would not be conducted. Mechanical treatment of hazardous fuels would be similar to Alternative 2. The impacts of this alternative would then be similar to the preferred alternative except for impacts attributed to prescribed fire. Both the direct and indirect adverse impacts on geology and soils would be regarded as short-term, localized, and minor.

Cumulative Effects: The direct and indirect effects of Alternative 3 on soils and geology would be adverse, localized, short-term, and minor. Grazing, mining, off-road vehicle travel, wildland fire, and erosion on adjacent lands contribute to cumulative effects, though these impacts would be localized and minor. No other projects or programs have been identified within the monument that will contribute to cumulative effects on soils and geology. Cumulative effects of Alternative 3 on soils and geology, then, are anticipated to be localized and minor.

Conclusion: Alternative 3 would result in localized, short-term, and minor direct and indirect adverse impacts to geology and soils. Alternative 3 would not produce any major adverse impacts or impairment of soil and geology resources or values whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

AIR QUALITY

Affected Environment. Fossil Butte NM is classified as a federal Class II Air Quality area. A Class II designation defines the maximum allowable increase in concentrations of pollutants over baseline concentrations of sulfur dioxide and particulate matter, as specified in the 1963 Clean Air Act (42 U.S.C. 7401 *et seq*.). Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts.

There are several fossil fuels activities near Fossil Butte National Monument. The Pacificorp Viva Naughton Power plant and the Pittsburgh and Midway open pit coal mine are within 10 miles of the monument. Williams Field Service has a natural gas processing facility approximately 25 miles downwind of Fossil Butte NM. British Petroleum and Chevron/Texaco operate sulfur loadout terminals approximately 9 miles south of Kemmerer, Wyoming, on U.S. Highway 189. Exxon operates a large gas processing plant approximately 35 miles east of the monument. Additional energy develop-

ments are more distant from the monument. Mobile sources of pollution in the area include railroads, motor vehicles and ranch equipment.

No air quality monitoring has been conducted at Fossil Butte NM. Wet deposition monitoring stations are located at Murphy Ridge, Utah (60 km southwest), and Pinedale, Wyoming (130 km northeast). Dry deposition is also colleted at Pinedale. Ozone monitoring stations are located near Logan, Utah.

Based on available information, there is no indication that Class II air quality standards are violated at Fossil Butte National Monument.

Methodology. Air pollution sources from the proposed project were compared with existing and proposed new pollution sources to determine potential for impacts. Information on the number of acres treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and fire return intervals. Available resource information from the monument, the Northern Colorado Plateau Network, and cooperating agencies was also considered in the analysis. Intensity of effects is defined above in Table 3.1.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Air quality related values would be protected from pollution sources emanating from within and outside park boundaries. Park management activities do not violate federal and state air quality standards.

Source – Clean Air Act; NPS Organic Act; NPS *Management Policies* (2001).

Impacts of Alternative 1: No- Action
Impact Analysis: Direct adverse impacts to air quality from wildland fire under the no-action alternative would include release of particulates and smoke into airshed and the potential for a slight increase in fugitive dust from suppression activities. On a local basis, air quality standards may be intermittently exceeded for brief periods (especially particulates) resulting in short-term, negligible to minor adverse impacts to air quality and visibility. Mitigation would include rapid suppression and extinguishing of remaining smoke from heavy fuels. On a regional basis, effects to air quality would generally include minor short-term adverse impacts, as quantities of pollutants, primarily particulates, are released to the atmosphere and travel beyond monument boundaries. Indirect adverse effects from these air emissions would include reduced visibility along roadways, reductions in recreation values due to visibility limitations, smoke and odors, and possible health effects to sensitive residents and visitors.

Under the no-action alternative, all wildland fires would be suppressed. Many vegetation communities in the monument have been without fire for nearly a complete fire re-

turn interval (see Fire History section) for that community. In an unmanaged system, portions of these communities might be expected to burn within the next 10-30 years. Although it is not possible to accurately predict the number of acres burned and amount of smoke generated, the recent past history suggests that there may be one or two wildland fires in a 20-year period.

Thus the direct and indirect adverse impacts of the no-action alternative would be short-term and minor on a local scale and negligible on a regional scale.

Cumulative Effects: The sources mentioned above contribute to cumulative effects on air quality at Fossil Butte NM. Current and expected future visitor and employee use patterns and levels as well as external sources such as traffic on highways, recreational user traffic, aircraft overflights, ranching activity, mining, off-road vehicle use, and wildland fires would continue to impact air quality in the park. Both direct and indirect adverse impacts of the no-action alternative would be short-term and minor on a local scale and nearly negligible on a regional scale. The cumulative effects on air quality, coming primarily from energy developments, would be localized and minor.

Conclusion: Adverse impacts to air quality and air quality-related values result from emissions of air pollutants, smoke and odors. Since recent wildland fire occurrence is so low and fire size so small, the direct and indirect adverse impacts of the no-action alternative to air quality would be localized, short-term, and minor. The no-action alternative would not produce any major adverse impacts or impairment of air quality or values whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management (preferred alternative)

Impact Analysis: Under Alternative 2, the preferred alternative, the additional sources of air pollution would come from prescribed burning and wildland fires. Prescribed burns tend to leave a mosaic of burned and unburned patches within a burn unit. Smoke events associated with the prescribed burns would be short-lived – in the order of hours to a few days. Ignition design and timing can minimize smoke production. Pile burning in the mechanical fuels treatment areas would be scheduled for the winter or spring and conducted on days of good smoke dispersion. Some additional smoke may be generated from utilization of the appropriate management response to fire suppression, though the additional acres burned would likely be small. The direct adverse impacts of the preferred alternative on air quality include short episodes of increased particulates and decreased visibility. These direct adverse impacts would be short-term, localized, and minor. Indirect and longer-term adverse impacts include contributions to regional haze and the possibility of wind-blown dust (e.g., from dust devils) near the burned areas. The indirect long-term impacts on air quality are negligible in a regional context.

The park will comply with all federal, state, and local air quality laws and regulations, specifically the U.S. Clean Air Act and smoke management regulations implemented by the State of Wyoming, Department of Environmental Quality.

The direct adverse impacts to air quality, compared to the no-action alternative, would be temporary, localized, and minor. Mitigation could be applied in the form of emission reduction techniques such as altered ignition patterns on prescribed fires, timing burns during periods of lower fuel moistures and good smoke dispersion conditions, piling debris prior to burning, or alternatives to burning such as mechanical removal of fuels. Indirect impacts to air quality would be negligible.

Cumulative Effects: The emission sources mentioned earlier contribute to cumulative effects on air quality at Fossil Butte NM. Current and expected future visitor and employee use patterns and levels as well as external sources such as traffic on highways, recreational user traffic, aircraft overflights, ranching activity, mining, off-road vehicle use, and wildland fires would continue to impact air quality in the park. The direct impacts of the preferred alternative would be short-term and minor on a local scale and nearly negligible on a regional scale. The indirect impacts of the preferred alternative would be negligible. The cumulative effects on air quality, coming primarily from energy developments, would be localized and minor.

Conclusion: Adverse impacts to air quality and air quality-related values result from emissions of air pollutants, smoke and odors. The direct impacts to air quality would be temporary, localized and minor. Indirect impacts to air quality would be negligible. The preferred alternative would not produce any major adverse impacts or impairment of air quality or values whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 3: Appropriate Management Response and Non- fire Fuels Management

Impact Analysis: Under Alternative 3, the impacts would be similar to those described under the preferred alternative, except that there would be no impacts attributable to prescribed fire. The burning of accumulated biomass from fuel reduction projects would contribute minor amounts of air pollution during periods of pile burning. Smoke events associated with the pile burning would be short-lived (on the order of a few hours). Pile burning in the mechanical fuels treatment areas would be scheduled for the winter or spring and conducted on days of good smoke dispersion. The park will comply with all federal, state, and local air quality laws and regulations, specifically the U.S. Clean Air Act and smoke management regulations implemented by the State of Wyoming, Department of Environmental Quality.

The direct adverse impact of Alternative 3, therefore, would be localized, short-term, and negligible to minor. Longer-term, indirect impacts from Alternative 3 would be negligible.

Cumulative Effects: The emission sources mentioned earlier contribute to cumulative effects on air quality at Fossil Butte NM. Current and expected future visitor and employee use patterns and levels as well as external sources such as traffic on highways, recreational user traffic, aircraft overflights, ranching activity, mining off-road vehicle use, and wildland fires would continue to impact air quality in the park. The direct impacts of Alternative 3 would be short-term and minor on a local scale and negligible on a regional scale. The indirect impacts of Alternative 3 would be negligible. The cumulative effects on air quality, coming primarily from energy developments, would be localized and minor.

Conclusion: Adverse impacts to air quality and air quality-related values result from emissions of air pollutants, smoke and odors. The direct impacts to air quality would be temporary, localized and minor. Indirect impacts to air quality would be negligible. Alternative 3 would not produce any major adverse impacts or impairment of air quality or values whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

WATER RESOURCES

Affected Environment. The water resources of Fossil Butte National Monument consist of seeps and springs, small streams supplied by springs, and ephemeral ponds and streams that carry snowmelt and precipitation runoff. Most of the springs and seeps originate along the base of the Green River formation. Since the recharge area for these springs and seeps is quite small, some may stop flowing during drought periods. Flows in streams dependent on snowmelt or precipitation vary within the year and among years, depending on the amount and timing of precipitation. Beaver ponds, slump ponds, and springs serve as watering areas for wildlife and breeding areas for beaver, amphibians, and a few shorebirds and waterfowl. The Resource Management Plan indicates that accurate documentation of all spring locations, spring and stream yields and water chemistry does not exist. Kyte (2001) provides considerably more detail on watersheds, streams, and springs.

Fossil Butte National Monument uses Spring #2 for the park water supply. The spring is situated north of the picnic area; water is collected and piped to the picnic area, monument headquarters, and other facilities.

Fossil Butte National Monument contains the headwaters of all its surface water. There are no known threats to surface water. Ground water could be impacted by oil and gas exploration and/or production near the monument.

Enabling legislation for Fossil Butte NM provides that water excess to the monument's needs may be made available to users outside the monument. Although water needs of the park have not been quantified, surface water from one spring is piped to a location outside the boundary for livestock use.

Chicken Creek and the springs which water aspen communities are the most evident water resources. Chicken Creek, which drains over 40% of Fossil Butte NM, is a partly interrupted-intermittent, partly ephemeral stream (Kyte 2001). The stream is affected by headcutting. The headcuts were apparently caused by grazing by domestic livestock and by railroad construction downstream of the drainage. Some restoration activities have been conducted, including planting willows along the stream.

Methodology. Information on the number of acres treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and fire return intervals. Available resource information from the monument, the Northern Colorado Plateau Network, and cooperating agencies was also considered in the analysis. Intensity of effects is defined above in Table 3.1.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Water resources would be protected from pollution sources or flow disruption from causes originating within or outside Fossil Butte NM boundaries. Fossil Butte National Monument management activities do not violate federal and state water quality standards.

Source – NPS Organic Act; NPS *Management Policies* (2001); Clean Water Act; Executive Order 12088

Impacts of Alternative 1: No- Action
Impact Analysis: Recent fire history does not provide much indication of future wildland fires since there has been only one recorded fire in the past 20 years. The fact that many vegetation communities are reaching the end of a normal fire return interval suggests that there may be more than one wildland fire during the next 20 years. As noted earlier, for purposes of analysis, one or two wildland fires totaling about 200 acres are projected to occur in the next 10-20 years.

The direct adverse effects of fire itself on monument water resources – such as interrupting or otherwise modifying water flows and water chemistry – would be negligible. Indirect adverse effects may include slight increases in water temperature if shading vegetation is burned, slight increases in sediment if fire removes vegetation immediately adjacent to water sources, and slightly increased streamflow since there would be less

vegetation and thus less transpiration on the burned areas. These indirect adverse impacts would be localized, short-term, and minor.

With the no-action alternative, initial attack suppression efforts would be made on every wildland fire. The direct adverse effect of fire suppression efforts would be negligible unless water was drawn from spring and streams for firefighting. If this occurred, the direct adverse effects of diminished flow would be localized, short-term (hours), and minor. Indirect adverse effects could include destabilizing stream banks or pond shores due to off-road travel with fire engines and other equipment. These indirect effects would also be localized, short-term, and minor.

Cumulative Effects: Projects within Fossil Butte NM that contribute to cumulative effects on water resources include the piping of water from two springs: one for monument use and one for livestock use outside Fossil Butte NM. The impact of these projects is localized and minor. Activities outside the park that contribute to cumulative effects on water resources include ranching, mining, and industrial activities. The direct effects of the no-action alternative would be negligible, though the potential indirect effects would be localized, short-term, and minor. The cumulative effects are localized and minor.

Conclusion: Direct effects of the no-action alternative would be negligible. Indirect effects would be short-term, localized, and minor. The no-action alternative would not produce any major adverse impacts or impairment of water resources or values whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management (preferred alternative)

Impact Analysis: With implementation of an appropriate management response, the potential exists for slightly larger wildland fires since managers may chose to utilize natural and man-made barriers rather than aggressive suppression of fires. The direct adverse effects of fire itself on monument water resources would be negligible. Indirect adverse effects may include slight increases in water temperature if shading vegetation is burned, slight increases in sediment if fire removes vegetation immediately adjacent to water sources, and slightly increased streamflow since there would be less vegetation and thus less transpiration on the burned areas. These indirect impacts would be localized, short-term, and minor.

In fire suppression, engines are often driven off-road to control the fire perimeter. With implementation of an appropriate management response, there would be less fireline constructed and a lowered likelihood of off-road use of engines as natural barriers are used to confine wildland fires. The direct adverse effect of fire suppression efforts would be negligible unless water was drawn from spring and streams for firefighting. If

this occurred, the direct adverse effects of reduced flow would be localized, short-term (hours), and minor. Indirect adverse effects could include destabilizing stream banks or pond shores due to off-road travel with fire engines and other equipment. These indirect effects would also be localized, short-term, and minor. They would be mitigated by reduced off-road travel and rehabilitation of any damaged stream banks.

Prescribed burning will likely affect more acres than wildland fire during the next several years. The direct adverse effects of prescribed burning would also be negligible; fire would not itself affect water resources. The potential indirect adverse effects may include slight increases in water temperature if shading vegetation is burned, slight increases in sediment if fire removes vegetation immediately adjacent to water sources, and slightly increased streamflow since there would be less vegetation and thus less transpiration on the burned areas. Prescribed fire would be managed to avoid or minimize the potential indirect impacts by maintaining, wherever possible, an unburned strip along the water source. These indirect adverse impacts would be localized, short-term, and negligible to minor.

Most mechanical reductions of hazard fuels would not be conducted adjacent to water resources. One project proposed for the near future would involve mechanical reduction of fuels on 15 acres near the picnic area, an area near the headwaters of Chicken Creek. The potential direct adverse impacts of this type of project include trampling of the streambank or similar disturbances by felled and/or dragged trees. These effects can be mitigated by avoidance, where possible, and immediate rehabilitation as part of the project. The indirect adverse effects of this type of project may be slight increases in water temperature if shading vegetation is removed and slightly increased streamflow since there would be less vegetation and thus less transpiration on the treated area. (Not implementing the project leaves a greater probability that the entire overstory may be consumed in a wildland fire, therefore eliminating shading and any stabilizing vegetation.) Implementing the project may provide a localized, minor benefit to water resources. Indirect impacts would be localized, short-term, and minor.

The direct adverse impacts of the preferred alternative on water resources would be negligible. The indirect adverse impacts would be short-term, localized, and negligible to minor.

Cumulative Effects: Projects within Fossil Butte NM that contribute to cumulative effects on water resources include the piping of water from two springs: one for monument use and one for livestock use outside the park. The impact of these projects is localized and minor. Activities outside the park that contribute to cumulative effects on water resources include ranching, mining and industrial activities. The direct effects of the preferred alternative would be negligible, though the potential indirect effects would be localized, short-term, and minor. The cumulative effects are localized and minor.

Conclusion: Direct adverse effects of the preferred alternative would be negligible. Indirect effects would be short-term, localized, and minor. The preferred alternative would not produce any major adverse impacts or impairment of water resources or values whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 3: Appropriate Management Response and Non- fire Fuels Management

Impact Analysis: The direct and indirect adverse impacts of Alternative 3 would be the same as those for the preferred alternative, except that there would be no adverse impacts attributed to prescribed burning. Therefore, the direct adverse effects would be negligible and the potential indirect adverse impacts would be localized, short-term, and minor.

Cumulative Effects: Projects within Fossil Butte NM that contribute to cumulative effects on water resources include the piping of water from two springs: one for monument use and one for livestock use outside the park. The impact of these projects is localized and minor. Activities outside the park that contribute to cumulative effects on water resources include ranching, mining and industrial activities. The direct effects of Alternative 3 would be negligible, though the potential indirect effects would be localized, short-term, and minor. The cumulative effects are localized and minor.

Conclusion: Direct adverse effects of Alternative 3 would be negligible. Indirect effects would be short-term, localized, and minor. Alternative 3 would not produce any major adverse impacts or impairment of water resources or values whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

WETLANDS

Affected Environment. Depressions formed by land slumping are common. Some of these catch runoff water and are wet only intermittently; others are fed by springs and seeps and hold water throughout much of the year. Some of these support wetland-type vegetation such as cattails and sedges. These range from less than a half acre to perhaps as large as two acres. Most are located north and east of the picnic area.

A few other small areas in the vicinity of seeps and springs that arise along the contact between the Green River and Wasatch formations, collectively comprising two to three acres, may also qualify as wetlands. These areas have sub-irrigated, mottled soils and support obligate wetland species of vegetation.

Methodology. Floodplain and wetland information is derived from Kyte (2001) and the Natural Resource Inventory and Monitoring Data (NPS 2002). Information on the number of acres treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and fire return intervals. Available resource information from the monument, the Northern Colorado Plateau Network, and cooperating agencies was also considered in the analysis. Intensity of effects is defined above in Table 3.1.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions –Wetlands retain their natural function. Changes within floodplain and wetlands remain within the range of natural variation.

Source – NPS Organic Act; NPS *Management Policies* (2001); E.O. 11988.

Impacts of Alternative 1: No- Action
Impact Analysis: Under the no-action alternative, only one wildland fire of about 200 acres is projected in this analysis during the next 10-20 years. Such fire would be unlikely to consume depression wetlands simply due to their locations, fuel discontinuities, and moisture levels. Direct adverse impacts from fire suppression on wetland function include ground disturbance and compaction from fireline construction and fire engines. These would be negligible since the wetlands themselves would usually serve as a barrier to fire. Potential indirect adverse impacts may include draining along vehicle tracks and firelines. These potential indirect effects would be very localized, short-term, and minor.

Cumulative Effects: Activities outside the monument that may contribute to cumulative effects on wetlands include ranching activities, wildland fire, and off-road vehicle use. No other projects within the park are anticipated that would adversely impact wetlands. The direct impacts of the no-action alternative would be negligible, while the potential indirect impacts would be localized, short-term, and minor. The cumulative effect on wetlands would be localized and minor.

Conclusion: Direct effects of the no-action alternative would be adverse and negligible. Indirect adverse effects would be short-term, localized, and minor. The no-action alternative would not produce any major adverse impacts or impairment of wetlands whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management (preferred alternative)

Impact Analysis: Under the preferred alternative, slightly larger acreage may be burned when the appropriate management response is applied to wildland fires. Because suppression activities could avoid sensitive areas, the net effect would be to reduce the potential direct and indirect adverse effects. The indirect adverse effect of using an appropriate management response would be localized, short-term, and beneficial when compared to the no-action alternative. The direct effects of wildland fire would still be negligible.

Some prescribed burning may occur near slump depressions for the purpose of restoring aspen groves. There would be no direct adverse impacts to the structure or function of slump depressions as a result of fire itself. Potential indirect adverse impacts may include structural disruption by firelines or use of equipment. These impacts can be avoided through planning and burn block preparation. Therefore, the indirect adverse impacts of prescribed burning would also be negligible.

Some mechanical treatment of hazard fuels may occur near slump depressions. For example, in the first 5-year period, treatment of 15 acres of aspen is proposed near the picnic area. The potential direct adverse effects of such hazard fuels treatments are trampling in or near the slump depressions and trees falling into the depressions. Neither of these should substantially influence wetland function. The adverse effects would be localized, short-term, and minor.

The direct adverse impacts of the preferred alternative on wetlands would be short term, localized, and negligible to minor. The indirect adverse impacts would also be localized, short-term, and minor.

Cumulative Effects: Activities outside the monument that may contribute to cumulative effects on wetlands include ranching activities, wildland fire, and off-road vehicle use. No other projects within the park are anticipated that would adversely impact wetlands. Both the direct and indirect adverse impacts of the preferred alternative would be localized, short-term, and minor. The cumulative effect on wetlands would be localized and minor.

Conclusion: Direct and indirect adverse effects of the preferred alternative would be short-term, localized, and minor. The preferred alternative would not produce any major adverse impacts or impairment of wetlands whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 3: Appropriate Management Response and Non- fire Fuels Management

Impact Analysis: The impacts of Alternative 3 would be the same as described for the preferred alternative, except for the impacts attributed to prescribed burning. Thus, the direct adverse impacts of Alternative 3 on wetlands would be short-term, localized, and negligible to minor. The indirect adverse impacts would also be localized, short-term, and minor.

Cumulative Effects: Activities outside the monument that may contribute to cumulative effects on wetlands include ranching activities, wildland fire, and off-road vehicle use. No other projects within the park are anticipated that would adversely impact wetlands. Both the direct and indirect adverse impacts of alternative 3 would be localized, short-term, and minor. The cumulative effect on wetlands would be localized and minor.

Conclusion: Direct and indirect adverse effects of Alternative 3 would be short-term, localized, and minor. Alternative 3 would not produce any major adverse impacts or impairment of wetlands whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

VEGETATION

Affected Environment. The draft Vegetation Management Plan (Kyte 2001) and the Grazing Impact Study (Dorn et al., 1984) provide considerable detail concerning the current and historic vegetation at Fossil Butte National Monument; the reader is directed to these sources for greater detail. Much of the information below is generalized from the two documents; the publications cited in those documents will not be re-cited below.

Approximately 530 taxa, 68 families, and 257 genera of plants are documented by specimen records in the monument. This is regarded as around 90% of the species that probably occur in Fossil Butte National Monument.

The Wyoming Natural Diversity Database has identified eight plants that they consider "species of special concern." These include Sodaville milkvetch (*Astragalas lentiginosus* var. *salinus*), Martin ceanothus (*Ceanothus martini*), western dodder (*Cuscuta occidentalis*), entire-leaved peppergrass (*Lepidium integrifolium* var. *integrifolium*), Wasatch biscuitroot (*Lomatium bicolor* var. *bicolor*), ternate desert-parsley (*Lomatium triternatum* var. *anomalum*), Payson beardtongue (*Penstemon paysoniorum*), and tufted twinpod (*Physaria condensata*).

Sodaville milkvetch (*Astragalas lentiginosus* var. *salinus*) is a short-lived perennial forb. Wyoming populations are found in big sagebrush communities on rocky clay slopes and ridges below rimrock at elevations of 6,540-6,800 feet. Population trends are unknown.

Principal threats include soil displacement and compaction by off-road vehicles and competition from exotic species. The plant is regarded as a low conservation priority.

Martin ceanothus (*Ceanothus martini*) is a non-thorny multi-branched low shrub. Wyoming populations occur on steep sagebrush slopes or mountain shrub communities on shallow-stony or hard clay soils at elevations of 7,600-8,080 feet. Population trends are not known. Principal threats include road construction, off-road vehicles and grazing. The plant is regarded as a low conservation priority.

Western dodder (*Cuscuta occidentalis*) is a rootless, annual parasitic herb. Wyoming populations occur in mountain big sagebrush slopes or mountain shrub communities at elevations of 6,400-7,600 feet. Population trends are not known. Principal threats include efforts to eradicate agricultural pests. The plant is regarded as a low conservation priority.

Entire-leaved peppergrass (*Lepidium integrifolium* var. *integrifolium*) is a perennial forb. Wyoming populations occur in sparsely vegetated and seasonally wet clay flats, greasewood communities on clay hummocks, and moist alkaline meadows at elevations of 6,200-6,770 feet. Population trends are not known. Principal threats include human development. The plant is regarded as a high conservation priority.

Wasatch biscuitroot (*Lomatium bicolor* var. *bicolor*) is a glabrous or minutely scabrous perennial forb. Wyoming populations occur in grassy montane meadows and forest edges on clay-loam soils or in alkali sagebrush communities at elevations of 7,500-8,500 feet. Population trends are probably stable. Principal threats are not known. The species is on the "watch list."

Ternate desert-parsley (*Lomatium triternatum* var. *anomalum*) is a pubescent perennial forb. Wyoming populations occur on ridgetops or slopes of brown clay-humus soil at elevations of 7,850-8,080 feet. Population trends are not known. Populations may be moderately threatened by natural erosion and landslides. The plant is regarded as a medium conservation priority.

Payson beardtongue (*Penstemon paysoniorum*) is a many-branched, tufted perennial herb endemic to the basins of southwestern and central Wyoming. Populations occur on barren hills, sandy creek bottoms, alkaline shale bluffs, and dry hills among sagebrush at elevations of 6,500-8,400 feet. Population trends are probably stable. Threats are relatively low but could include surface disturbances. The species is on the "watch list."

Tufted twinpod (*Physaria condensata*) is a prostrate, rosette-forming perennial forb, a narrow endemic of the southern Overthrust Belt and lower Green River Basin in southwest Wyoming. Populations occur on dry, rocky calcareous knolls and ridges, clay banks, and shaley hills in sparsely vegetated cushion plant communities in openings

within sagebrush grassland at elevations of 6,700-7,400 feet. Population trends are apparently stable. Threats are apparently minimal, though development associated with mineral exploration may be a potential short-term threat. The plant is regarded as a high conservation priority.

None of these species have legal protection under the Endangered Species Act. By policy, however, the NPS protects habitat for state-identified sensitive species. The locations of most occurrences of tufted twinpod are known, and a map of the sites where this plant grows will be available prior to the fall of 2005 when the first burn under the preferred alternative would occur. Martin ceanothus occurs in only one location in Fossil Butte NM. Both species grow on or immediately adjacent to slopes that exceed a gradient of 3:1. Habitat for tufted twinpod and Martin ceanothus will be protected because prescribed fire is not proposed for 3:1 slopes. Tufted twinpod also occurs where vegetation is generally too sparse to carry fire.

The distribution of entire-leaved pepperweed has been mapped. It grows in small stands located in saline areas where the vegetation is usually too sparse to carry fire. Fire will be excluded from areas where entire-leaved pepperweed is known to occur.

Payson beardtoungue has been observed primarily where the Wasatch formation forms the badlands that support very little vegetation. Badland areas are not expected to carry fire. Payson beardtongue also grows in areas dominated by low sagebrush. Only a small portion of the low sagebrush community in Fossil Butte NM is expected to carry fire. Also, stands of vegetation dominated by low sagebrush will not be ignited deliberately. The lack of fuel and low amount of shrub cover in the majority of Fossil Butte NM's stands of low sagebrush indicates that these vegetation types will either not burn or it will burn in a patchy mosaic. Badlands and unburned areas dominated by low sagebrush will provide adequate habitat for Payson beardtongue.

Wasatch biscuitroot also occurs primarily in the low sage community. Unburned stands of this vegetation type will afford Wasatch biscuitroot adequate habitat protection.

The distributions of Sodaville milkvetch, Western dodder, and ternate desert-parsley in Fossil Butte NM are unknown, but Sodaville milkvetch and ternate desert-parsley are believed to be rather widely distributed and there appears to be considerable habitat for all three species in Fossil Butte NM. Sodaville milkvetch and ternate desert-parsley appear to be more common than dodder, and they are thought to be adapted to fire. Only four small patches (<10 sq. ft./patch) of Western dodder have been observed in Fossil Butte NM. It is very inconspicuous, and would likely be overlooked even if searches designed to locate it were conducted prior to prescribed burns. Managing prescribed fire to attain a mosaic of burned and unburned vegetation in any given area, limiting the size of the area treated with fire in any given period of time, and suppressing wildland fires is expected to sustain the presence of these species and afford them adequate habitat protection.

Over the long term, using fire to maintain components of Fossil Butte National Monument's vegetation in various seral stages (as happened naturally when wildland fire burned uncontrolled) will assure there is always adequate habitat for a wide variety of plant species.

The largest vegetation types in Fossil Butte NM are dominated by sagebrush (Figure 3): basin big sagebrush communities (2,573 acres), mountain big sagebrush communities (1,338 acres), and alkali sagebrush (2,031 acres). Both basin and mountain big sagebrush communities have a short fire return interval (see Fire History above), while the alkali sagebrush fire return interval appears to be variable.

The mixed timber type (236 acres) is mainly limber pine which also has a short fire return interval for low intensity fire (FEIS). Most of the lands occupied by these vegetation types have been without fire for nearly an entire interval. The aspen communities (427 acres) are generally at the far extent of their fire return intervals. Some of these communities may have missed a fire return interval.

Dorn et al., (1984) suggests that on a broad scale, the vegetation at Fossil Butte National Monument looked, in 1984, much like it would have in pre- domestic grazing periods. They suggest that livestock and other disturbances have changed mainly the distribution and abundance of grasses and forbs. The report notes that evidence of past fires is widespread in the monument and that any increase in sagebrush is probably due to an absence of fire since European settlement.

The draft Vegetation Management Plan (Kyte 2001) states that 5 species on the Wyoming noxious weed list are relatively abundant in Fossil Butte NM. These include Canada thistle, musk thistle, henbane, spotted knapweed, and houndstongue. Weed control records and weed distribution maps show that Canada thistle occurs primarily in the vicinity of beaver ponds, seeps, streams, and slump ponds. As of September, 2004, fewer than 20 acres of Canada thistle are known to occur in the monument. Musk thistle occurs primarily on soils disturbed by beaver activity, rodent burrowing, historic human activity, and slumping. As of September, 2004, fewer than 10 acres of musk thistle are known to occur in Fossil Butte NM. Control efforts have reduced its population in recent years. Small stands of houndstongue appear to be confined presently to a 5-acre area of land disturbed by slumping in Section 25 along the base of Cundick Ridge. Presently less than one acre of land in Section 23 is known to be infested by a few hundred spotted knapweed plants. The population has declined significantly since 1994.

Cheatgrass occurs in Fossil Butte NM but it is not widely distributed and it is not presently targeted for control. It occurs primarily along roads and in areas in the south half of the monument where overgrazing or other disturbances related to modern human activity have occurred. Cheatgrass can spread rapidly from seed and become dominant following fires that eliminate competing vegetation. Cured cheatgrass is highly flamma-

ble. It burns hot and frequently if it becomes abundant. This sometimes results in an alteration of the natural fire regime.

Most park management documents include direction to reduce the occurrence and dominance of nonnative species. Kyte (2001) recommends a management scheme that includes survey (inventory), monitoring, and restoration of areas dominated by nonnative species. Restoration tools identified by Kyte (2001) include hand pulling, biological agents, mowing and other mechanical treatments, and chemical treatments. Such restoration is beyond the scope of the Fire Management Plan.

The following information concerning fire ecology and fire effects on native and invasive nonnative species is drawn from the Fire Effect Information System (FEIS) (http://www.fs.fed.us/database/feis). More information is available at the website.

- Native grasses such as needle-and-thread, blue grama, western wheatgrass, bluebunch wheatgrass, Canada wildrye, and sand dropseed generally respond vigorously to fire, particularly fire in the later summer when the grasses are dormant. Fire effects studies at Dinosaur National Monument in northwest Colorado indicate that response is strongest when fires have short residence times (Perryman et al., 2002).
- Mature limber pine with thicker bark can survive surface fires; young trees are often killed. The vulnerability of the species to fire is reduced by the open stand structure and sparse understory fuels. (As noted earlier, Dorn et al., (1984) reported evidence of earlier fires in limber pine communities.)
- Aspen responds vigorously to fire with sprouting that may produce several thousand stems per acre. Research indicates that resprouting is more vigorous when the above ground material is removed for the entire clone.
- Mountain big sagebrush is very vulnerable to wildland fire; plants are readily killed by even low severity fires. Regeneration is by seed rather than resprouting. Mountain big sagebrush seeds may sprout profusely the spring after burning and reach reproductive maturity in 3 to 5 years. Regeneration is enhanced by leaving unburned patches of sagebrush. (Profuse regeneration was observed on a prescribed fire just a few miles southwest of Fossil Butte NM.)
- Basin big sage is also readily killed by fire and regenerates by seed rather than resprouting. On-site seed sources are more important than off-site sources since seed is not disseminated for great distances. Regeneration may be slower than in mountain big sage. Burning of basin big sage stands is not recommended where cheatgrass cover exceeds 50% or the cover of native grasses is less than 20%.
- Alkali sagebrush (low sagebrush) is readily killed by fire; regeneration is by seed. The FEIS cautions against using fire to manage low sage and suggest fire only be used when: 1) soils are stable and slopes less than 30%; 2) sagebrush is dense and is more than 33% of plant cover (scattered brush does not limit range productivity); 3) fire resistant grasses and forbs are more than 20% of cover, and 4) wildlife issues have been taken into consideration as sagebrush is an important part of di-

ets in some areas. FEIS also indicates that the wide spacing of individual plants and lack of a grass/forb understory inhibit the spread of fire in this vegetation type. Recovery can be as quick as 2 – 5 years, or can take up to 10+ years depending on the seed source, and other environmental factors.

- Alkali or low sagebrush will not be ignited deliberately, but fire will be allowed to carry into stands where low sage covers more than 33% of the ground. Fire will be excluded from stands of low sage growing on steep slopes (a gradient that exceeds 3:1).
- Utah serviceberry is generally fire tolerant, though heavy litter accumulations may increase mortality. Above ground parts may be consumed by fire but plants sprout vigorously from the root crown.
- Antelope bitterbrush is very susceptible to fire kill. It is generally considered a weak sprouter, though decumbent plants seem to sprout better than columnar forms. Very young and very old plants do not sprout well. Sprouting is apparently most influenced by plant genetics and fire severity. Bitterbrush seeds will also germinate and grow on mineral soil exposed by fire.
- Common snowberry is top-killed by fire but the below ground parts are very resistant to fire. Following fire, sprouting occurs from rhizomes buried two to five inches deep in the soil. The species survives even severe fires and is among the first to colonize burned sites. Dorn, et al (1984) observed that snowberry was rather abundant on some parts of Fossil Butte NM and they believed its abundance was a response to the area's fire history.
- Although rubber rabbitbrush is often top-killed by fire, mortality is usually low. Recovery of rabbitbrush is rapid and may occur by means of vigorous sprouting as well as seed germination.
- Canada thistle can survive individual fires, but repeated burning on relatively short intervals (annually to every 4 or 5 years) reduces plant density, especially when burning during periods that favor native grasses. Early spring burning of Canada thistle may result in vigorous sprouting and reproduction.
- Musk thistle may or may not be killed by fire. Studies show that musk thistle colonization may either be enhanced or depressed following fire. Response seems to be primarily related to the abundance of competitors (e.g., native grasses) following fire. Studies indicated musk thistle response was less in shrublands following burning where grasses became dominant than in sites where there was no native grass seed bank.
- Houndstongue is probably top-killed by fire, but high severity fire would probably be necessary to kill the plants due to their hardy tap root system. Rapid response by native grasses and forbs would probably depress houndstongue response.
- Spotted knapweed is top-killed and stressed, but its roots and seeds probably survive fire. Native species stimulated by fire may provide effective competition even when spotted knapweed resprouts or regenerates from seed.

Information on fire effects of the other invasive species at Fossil Butte National Monument was not available in the Fire Effects Information System.

Mitigations to reduce impacts to vegetation from the proposed fire management plan include planning treatments on a size and scale generally representative of the natural range of variability in each vegetation type's fire return interval. Mitigations designed to protect species of concern in sagebrush will generally follow those outlined in the Wyoming Guidelines for Managing Sagebrush Communities with Emphasis on Fire Management (Wyoming Interagency Vegetation Committee, 2002) and Guidelines to manage sage grouse populations and their habitats (Connelly, et al. 2000) when those guidelines coincide with Fossil Butte National Monument management objectives.

Methodology. Information on the number of acres treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and fire return intervals. Available resource information from the monument, the Northern Colorado Plateau Network, and cooperating agencies was also considered in the analysis. Other information was gathered from the professional literature. Intensity of effects is defined above in Table 3.1.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Vegetation communities in Fossil Butte National Monument would be restored and would maintain long-term ecological diversity and stability, with fire-dependent communities sustained by fire and fire intolerant communities protected from wildland fire.

Source – NPS Organic Act, NPS *Management Policies* (2001)

Impacts of Alternative 1: No- Action
Impact Analysis: Under this alternative, wildland fires would be suppressed. Given recent fire incidence and typical fire return intervals, an estimated one or two fires may occur within the next 10-20 years with burned area estimated at 200 acres. In Fossil Butte National Monument, fuel discontinuities would likely prevent large fire size except under the most extreme conditions.

The direct adverse impacts of wildland fire include removal of above ground biomass. Some mortality of grass, shrub, and tree species would result, especially if the residence time of fire is extended and the severity (downward heat pulse) is subsequently increased. No fire effects monitoring or research has been conducted at Fossil Butte NM; however, fire effects studies at Dinosaur National Monument in northwest Colorado showed that mortality of needle-and-thread and Indian ricegrass averaged over a two-year period following a head fire was not substantially different from mortality expected from plant senility (Delafield 1997).

Indirect adverse effects of wildland fire on these vegetation community types is varied, depending on species affected (whether they sprout or not in response to fire) and the degree of immediate impact (whether individual plants are killed or not). The response of communities would be expected to be within the normal range of response where those communities are already dominated by native species. Resprouting by grass and many shrubs would be expected during the same year as burning or, if the year is particularly dry, no later than the next spring. The timing and intensity of burning may result in an indirect effect – a slight shift in species composition, though the degree of shift would be minor.

The direct effect of wildland fire to nonnative species would include removal of above ground biomass and some mortality of individual plants. The indirect impacts may range from expansion/proliferation of nonnative species in the burned area to depression of nonnative species. The response is largely dependent on the time and intensity of burning as well as secondary factors such as competition with native species, reseeding the burned area with native species, or other subsequent treatment(s) of nonnative species.

The direct adverse impacts of wildland fire under the no-action alternative, particularly given the low occurrence of wildland fire and small acreages burned, would be localized, short-term, and minor. The indirect adverse impacts would be localized, short-term, and negligible.

Cumulative Effects: The direct adverse impacts of wildland fire under the no-action alternative would be localized, short-term, and minor. The indirect adverse impacts would be localized, short-term, and negligible. Other vegetation management actions which contribute to cumulative effects on vegetation at Fossil Butte NM include treatments of invasive nonnative species; these would have minor to moderate beneficial effects on vegetation communities. Continued grazing by domestic livestock outside the monument, by removing fine fuels and making fire spread less likely, reduces the incidence of wildland fire entering the monument from adjacent lands. Livestock drives through the monument may also diminish the fine fuels important to fire spread. Since maintenance of vigorous fire dependent communities is desirable, these effects, though minor, are considered adverse. Wildland and prescribed fire outside the monument also contribute to cumulative impacts. The cumulative effects of the no-action alternative would be localized and negligible to minor. Over a period of years, fire exclusion in fire-dependent vegetation communities would be expected to be moderately adverse.

Conclusion: The no-action alternative would have localized, short-term, and minor direct adverse impacts on vegetation communities. The indirect adverse impacts would be localized, short-term, and negligible. The no-action alternative would not produce any major adverse impacts or impairment of vegetation communities whose conservation is necessary to the purpose of the establishment of the monument, that are key to

the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument. Nonetheless, continued exclusion of fire from fire-dependent communities would result in changes in species composition and distribution which may render those communities more susceptible to high severity fire. With high severity fire, subsequent fire effects may be outside the normal range of variation (e.g. rather than the existing community regenerating itself, an entirely new community may result).

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management (preferred alternative)

Impact Analysis: Under the preferred alternative, slightly larger acreage may be burned when the appropriate management response is applied to wildland fires. Plant communities at Fossil Butte National Monument that are vulnerable to wildland fire are generally fire-adapted or fire-dependent communities – i.e., fire is the natural recycling agent. The direct and indirect adverse effects of wildland fire on vegetation would be the same as those described under the no-action alternative, except that the acres burned may be incrementally larger.

With an appropriate management response, suppression activities could avoid sensitive plant communities. The net effect of reducing such disturbance, even with larger burned acreage, would be a localized, short-term, negligible to minor beneficial impact.

Under this alternative, a unit consisting of approximately 1,595 acres would be treated with prescribed fire in the first five-year period. This unit is in the sagebrush vegetation type, with isolated conifer and aspen stands (Table 2.1). The goal of the burn would be to create a patchy mosaic of burned and unburned sagebrush stands, with removal of vegetation on 30% to 60% of the area dominated by basin and mountain big sagebrush. Alkali sage and timber communities on the northern side of Ruby Point would not be ignited.

Burning to regenerate aspen the stands would treat between 25 and 100 acres every other year after 2005 (independent of the burn described above); approximately 300 acres of aspen would be treated in the foreseeable future (11 years). In subsequent years, surface burning may be conducted in limber pine stands.

Large to moderate scale prescribed fires tend to create a mosaic of burned and unburned patches within a burn unit. The objective of such burning is the restoration and/or maintenance of native fire-adapted plant communities (plant communities that established in their current location along with fire). Smaller scale burns with specific fuel reduction objectives may target higher levels of vegetation removal in order to achieve the desired decrease in potential fire intensity in fuels adjacent to high visitor use areas.

The direct effects of such burning in sagebrush communities are removal of above ground biomass, including accumulated litter, and mortality to individual sagebrush plants. The direct effect in aspen would be removal of above ground biomass. The direct effects of low severity fire in limber pine stands would be reduction of understory density, loss of many of the small trees, and limited mortality to mature limber pine trees.

The indirect beneficial effect of such burning is rejuvenation of the burned stands. In mountain big sagebrush communities, based on the literature and the example of burns on lands adjacent to the monument, regeneration of mountain big sage would be expected to be vigorous within one to three years following burning when precipitation is adequate during the growing season. Mountain big sagebrush can take longer to recover when precipitation falls below the yearly average for the area. Regeneration of other types of sage may be slower and more dependent on adjacent seed sources. Such seed sources would be preserved through a patchy burn pattern, with stands of sage intentionally left unburned throughout the burn unit. Alkali sage will generally not carry fire due to the spacing of individual plants and a sparse grass/forb understory. It will not be intentionally ignited.

The response of native grasses to wildland fire, and particularly to fires with short residence times, is low mortality (less than 20% of individual plants) and vigorous regrowth from existing root stock.

The response of aspen clones to burning is vigorous resprouting, often with hundreds to thousands of stems per acre. In limber pine, low severity surface burns would render the community less vulnerable to a high intensity fire by removing fuel from the understory.

Over 300 elk have occupied Fossil Butte National Monument during portions of recent falls and winters seasons. An indirect impact of prescribed burning may be that elk stay longer (or more elk enter) in the monument in response to the new vegetation following burning. This could be evident in sagebrush, aspen, and limber pine communities. If grazing pressure by elk becomes heavy, it could retard vegetation responses in some areas. Conversely, since the BLM will burn nearly 16,000 acres bordering the west boundary of the monument, elk may well be attracted to that area and not come onto or stay as long on the monument.

Since most elk use occurs after grasses become dormant, there would be relatively little adverse effect on native grasses within the monument. Mitigation measures may include electric fence to exclude elk from sensitive areas (e.g., new aspen stands) and hazing elk from the monument. Adverse impacts would also be lessened by prescribed burning outside the monument, creating an alternate food source.

The direct impact of prescribed burning would be localized and short-term. In the context of individual plants, the direct impact would be adverse and moderate. In an ecological context, the impact on plant communities would be beneficial and moderate as a result of greater stand stability, diversity, and robustness. Therefore, the longer-term indirect effects would be localized, beneficial, and moderate.

The direct impacts of burning on nonnative species are less certain and may range from suppression of some nonnatives to stimulation of others. Each prescribed fire burn plan which involves patches of nonnative species should consider the species present and design the burn to discourage nonnatives and encourage native species. Further investigation and monitoring of initial prescribed burns may refine prescriptions for use of fire in management of invasive nonnative species.

Manual hazard fuels reduction projects would focus on reducing fuel loading around the picnic area, park headquarters, and the Haddenham Cabin. The direct beneficial effect of these actions would be reduced vegetation density. The indirect beneficial effect would be to reduce the vulnerability of these stands and the associated visitor use areas to a high intensity wildland fire. Both the direct and indirect impacts, then, are regarded as beneficial, localized, short-term, and minor.

The direct impacts of the preferred alternative on vegetation communities would be localized, short-term, minor to moderate, and adverse to individual plants but beneficial to plant communities. The long-term indirect effects would be localized, beneficial and minor to moderate.

Cumulative Effects: The direct adverse impacts of wildland fire, fire suppression, prescribed burning, and mechanical reduction of hazard fuels under the preferred alternative would be localized, short-term, and minor. The indirect impacts would be localized, long-term, beneficial, and minor to moderate. Other vegetation management actions which contribute to cumulative effects on vegetation at Fossil Butte NM are limited to treatments of invasive nonnative species; these would have minor to moderate beneficial long-term effects on vegetation communities. Continued grazing by domestic livestock outside the monument, by removing fine fuels and making fire spread less likely, reduces the incidence of wildland fire entering the monument from adjacent lands. Livestock drives through the monument may also diminish the fine fuels important to fire spread. Since maintenance of vigorous fire dependent communities is desirable, these effects, though minor, are considered adverse. Wildland and prescribed fire outside the monument also contribute to cumulative impacts. The cumulative effects of the preferred alternative, therefore, would be localized, minor to moderate, and beneficial in an ecological context.

Conclusion: The preferred alternative would have localized, short-term, and minor to moderate adverse and beneficial direct impacts on vegetation communities. The indirect impacts would be localized, long-term, beneficial, and minor to moderate. The pre-

ferred alternative would not produce any major adverse impacts or impairment of vegetation communities whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 3: Appropriate Management Response and Non- fire Fuels Management

Impact Analysis: With Alternative 3, there may be a slight increase in burned acreage under an appropriate management response to wildland fire. Use of the appropriate management response would avoid the adverse impacts of suppression activities in sensitive vegetation communities. The direct and indirect impacts of wildland fire suppression under Alternative 3 would be similar to those described under the preferred alternative. Since prescribed fire would not be authorized under this alternative, the long-term beneficial indirect impacts of prescribed burning would not be achieved. The beneficial impact of proposed mechanical fuels reductions should be the same as described under the preferred alternative.

The direct impacts of Alternative 3 would be localized, short-term, and minor. They would be adverse from the perspective of individual plants, but beneficial from the perspective of plant communities. The indirect effects would be localized, short-term, minor, and beneficial.

Cumulative Effects: The direct adverse impacts of wildland fire under Alternative 3 would be localized, short-term, and minor. The indirect impacts would also be localized, short-term, minor, and both adverse and beneficial. Other vegetation management actions which contribute to cumulative effects on vegetation at Fossil Butte NM are limited to treatments of invasive nonnative species; these would have minor to moderate beneficial long-term effects on vegetation communities. Continued grazing by domestic livestock outside the monument, by removing fine fuels and making fire spread less likely, reduces the incidence of wildland fire entering the monument from adjacent lands. Livestock drives through the monument may also diminish the fine fuels important to fire spread. Since maintenance of vigorous fire dependent communities is desirable, these effects, though minor, are considered long-term and adverse. Wildland and prescribed fire outside the monument also contribute to cumulative impacts. The cumulative effects of Alternative 3, therefore, would be localized and minor. Over a period of years, fire exclusion in fire-dependent vegetation communities would be moderately adverse.

Conclusion: Alternative 3 would have localized, short-term, and minor direct impacts on vegetation. They would be adverse from the perspective of individual plants, but beneficial from the perspective of plant communities. The indirect impacts would be localized, short-term, and minor. Alternative 3 would not produce any major adverse impacts or impairment of vegetation communities whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural

integrity of the monument, or that are actions identified as a management goal of the monument. As in Alternative 1, continued exclusion of fire from fire-dependent communities would result in changes in species composition and distribution which may render those communities more susceptible to high severity fire. With high severity fire, subsequent fire effects may be outside the normal range of variation (e.g. rather than the existing community regenerating itself, an entirely new community may result).

WILDLIFE

Affected Environment. Fossil Butte National Monument contains a variety of wildlife typical of the high plains and Rocky Mountain area. Mammals frequenting the area include elk, moose, mule deer, coyote, beaver, muskrat, cottontail, jackrabbit, and several rodents. Birds include a suite of passerines, waterfowl, sage grouse, woodpeckers, and raptors.

An increasing number of elk have been observed in the monument during past winters. In 2002, over 350 head were present by October.

The U.S. Fish and Wildlife Service also provided a list of migratory bird species of management concern in Wyoming. The list identifies two levels of concern. Species listed in the Level I category need conservation action. Monitoring is indicated for species listed in the Level II category. Species known or suspected to occur in Fossil Butte National Monument, their habitats, and category of concern are identified in Table 6 below.

Table 3.2. Migratory Birds of Management Concern in Fossil Butte NM.

Level	Species	Habitats
I	Sage grouse	Shrub-steppe (sagebrush)
I	Ferruginous hawk	Shrub-steppe (sagebrush)
I	Brewer's sparrow	Shrub-steppe (sagebrush), mountain shrub
I	Franklin's gull	Wetlands
I	Sage sparrow	Shrub-steppe (sagebrush), mountain shrub
I	Swainson's hawk	Riparian
I	Northern goshawk	Conifer, aspen
I	Peregrine falcon	Cliffs
I	Burrowing owl	Shortgrass prairie
I	Forster's tern	Wetlands
I	Whooping crane	Wetlands
II	Calliope hummingbird	Conifer, riparian
II	Lewis' woodpecker	Conifer, riparian
II	Lark bunting	Prairie, Shrub-steppe (sagebrush)
II	Williamson's sapsucker	Conifer
II	Black-chinned hummingbird	Riparian, Shrub-steppe (sagebrush)

	mingbird	
II	Red-naped sapsucker	Aspen
II	Three-toed woodpecker	Conifer
II	Hammond's flycatcher	Conifer, aspen, riparian
II	Marsh wren	Wetlands
II	Plumbeous vireo	Conifer
II	Dusky flycatcher	Conifer, aspen, shrub
II	Sage thrasher	Shrub-steppe (sagebrush)
II	Grasshopper sparrow	Shrub-steppe (sagebrush), prairie
II	Bobolink	Shrub-steppe (sagebrush), prairie
II	Western screech owl	Riparian
II	Broad-tailed humming-bird	Riparian, conifer
II	Western scrub jay	Juniper woodland
II	Loggerhead shrike	Shrub-steppe (sagebrush)
II	Vesper sparrow	Shrub-steppe (sagebrush)
II	Lark sparrow	Shrub-steppe (sagebrush)
II	Golden-crowned king-let	Conifer
II	Ash-throated flycatcher	Juniper woodland
II	Common tern	Wetlands

Three wildlife species of elevated concern at Fossil Butte NM are pygmy rabbits (*Brachylagus idahoensis*), sage grouse (*Centrocercus ophasianus*), and mountain plover (*Charadrius montanus*). While these species are not included on State or Federal endangered species lists, apparent population declines and/or perceived habitat degradation on a range-wide basis have prompted expressions of concern by various individuals and agencies.

A study of the winter ecology of pygmy rabbits was conducted at Fossil Butte National Monument in 1983 and 1984. The information below is summarized from Katzner (1994), Katzner and Parker (1997), and from FEIS (http://www.fs.fed.us/database/feis). The FEIS website defines pygmy rabbit habitat as "limited to areas on deep soils with tall dense sagebrush which they use for cover and food. Individual sagebrush plants in areas inhabited by pygmy rabbits are often six feet (1.8 meters) or more in height." Pygmy rabbits are extreme specialists in sagebrush-dominated habitats. They selectively use dense and structurally diverse stands of basin big sagebrush, although they consume all species of big sagebrush. General use areas tend to have two or more subspecies of sagebrush and few forbs; core areas were characterized by basin big sagebrush with taller, more dense biomass, more standing dead vegetation, and a thick canopy. Soil types may be important for burrowing by pygmy rabbits; areas that support the densest stands of basin big sagebrush in Fossil Butte NM have deep loamy soils. Raptors were

the most important source of mortality in the Fossil Butte National Monument study and dense layers of vegetation would provide the greatest security to rabbits.

A pygmy rabbit population survey at Fossil Butte National Monument (Gruver 2003) indicates that basin big sagebrush (*Artemisia tridentata tridentata)* is the primary habitat (50.8% of all activity) and that mountain big sagebrush (*Artemisia tridentata vaseyana)* is secondary habitat (35% of activity). High plant density in mountain big sagebrush stands bordering well-established basin big sagebrush communities may account for the high frequency of burrows observed in mountain big sagebrush during the Gruver study. These stands provide for continuous cover from birds of prey commonly found in and around the park.

There is one known sage grouse lek in the monument. The grouse move between two strutting grounds located approximately one-half mile apart in Sections 35 and 36, both of which are visible from the Visitor Center. To avoid disturbance, roads adjacent to the lek are closed until after the grouse have stopped strutting. Between 1997 (when the lek was first discovered) and 2004, lek attendance by male grouse has varied from 14 to 45 individuals.

Most sage grouse in Fossil Butte National Monument are probably non-migratory, but some birds tracked by radio telemetry traveled substantial distances from wintering areas to leks (breeding areas) in Fossil Butte NM (Lockwood 2003). FEIS cites many studies concerning sage grouse and wildland fire. The information provided here is summarized from FEIS. Fire-related mortality of sage grouse has not been documented in the literature. Fire effects may be beneficial or adverse to sage grouse, depending on the type of burning and season of use. Sage grouse use sagebrush of different age classes and stand structure for different life history events at different seasons. Fire effects, then, may be described by seasons of use. The following is an abbreviated summary of some of the research results described in FEIS and other scientific literature.

<u>Breeding:</u>

- Sage grouse continued to use leks located within extensive burns in spite of the loss of vegetative cover immediately adjacent to the leks. Birds appeared to loaf, feed, and roost in unburned habitat and fly into the burned leks.
- Leks used by migratory populations appear to be more susceptible to adverse habitat-related fire effects because they are usually dominated by Wyoming big sage which re-establishes more slowly following fire.

<u>Nesting:</u>

- Areas within a 1.9 mile radius of leks are considered most important for nesting, though some hens may move 20-30 miles to nest.
- There is often a complex of habitat types near leks; non-migratory birds may find year-around needs provided in these instances.

- Complete removal of sagebrush in burned areas could reduce nesting; nests in burned areas are usually found in unburned patches of sagebrush.

Brood rearing:

- Brood habitat typically has 15-25% shrub canopy cover, but at least 10-20% cover of live forbs and grasses.
- Abundant food forbs near unburned sagebrush cover may benefit broods by providing additional food associated with adequate cover, and fire-enhanced flowering may improve food availability.
- Effects of wildland fire on brood rearing seem to be more severe in Wyoming big sage habitats than in basin or mountain big sage habitats.
- Patchy burns could enhance brood-rearing habitats if the availability of forbs and insects is increased on the burn.

Summer:

- Sagebrush and forbs are essential components of summer habitats; summer habitats have been characterized by shrub canopy of at least 15% and forb cover of at least 10%.
- Some studies have shown a substantial decline in summer use of burned areas; this response seems to be more marked in Wyoming big sage habitats.
- Sage grouse have been reported to be attracted to burned areas during summer (see particularly Klebenow et al. 1978, Martin 1990, and Slater 2003).

Winter:

- Winter habitats are described as the most limiting seasonal habitat; most winter habitats are sagebrush with more than 20% canopy coverage.
- With non-migratory populations, wintering areas are often within two miles of leks.

Some researchers cited in FEIS pointed out that the apparent absence of sage grouse after certain wildland fires did not mean a loss of birds, but rather a redistribution of birds into adjacent habitats. Others reported that four factors determine whether fire responses in sage grouse habitat would be beneficial or detrimental: (1) site potential, (2) site condition, (3) functional plant groups that are limiting, and (4) pattern/size of the burn. FEIS notes that "fire is a useful tool to enhance native perennial grasses and forbs, particularly in areas where sagebrush is abundant, a 'good' population of native forbs is present, and exotic species are limited. This most often applies to mountain big sagebrush communities…"

The mountain plover uses bare or nearly bare areas for nesting – areas of very short and sparse vegetation; vegetation on these sites would likely be too discontinuous to support fire.

Fire effects studies in Dinosaur National Monument, an area with similar wildlife communities, indicated that while there was decreased small mammal community diversity in the initial years following burning of shrublands, there was no long-term impact on species richness and similarity (Olson et al., 2003). There were no differences in diversity indexes between burned and control plots across sample years and sites combined; diversity on burned plots generally fluctuated more across post-burn sample years by site than did diversity on control plots. There were shifts in species composition within communities during early post-burn years. It is expected the shifts would be similar when shrublands are burned at Fossil Butte National Monument.

Larger mammals may be temporarily displaced by fire, but fire effects studies on mule deer and elk in Dinosaur National Monument indicated increased use of post-burn habitats.

Olson et al., (*in prep*) found that species richness, density, and diversity of breeding birds at Dinosaur National Monument were higher on burned than unburned plots across all sites during the early post-burn period (1-5 years), but lower on burned plots during later post-burn periods (5+ years). Similarity index values indicated maximum overlap of bird species between burned and unburned plots across all sites during the intermediate post-burn years and minimal overlap during early and late post-burn periods. They concluded that wildland fire in Wyoming big sagebrush communities results in short-term (5-7 years) increased species richness, density, and community diversity on burned sites. Though not analyzed by Olson et al., (*in prep*), some species appeared to be nearly obligate in unburned sites (e.g., green-tailed towhee) while granivores appear to be more common in the burned sites. As a general conclusion, then, it appears that burning in Wyoming big sagebrush does not adversely effect breeding bird populations.

Surveys conducted by the NPS Inventory and Monitoring Network documented the presence of tiger salamanders (*Ambystoma tigrinum*), boreal chorus frogs (*Pseudacris maculate*), northern leopard frogs (*Rana pipiens*), mountain short horned lizards (*Thamnophis elegrams vagrans*) at Fossil Butte NM (Platenberg and Graham 2003). Amphibian habitat is limited to slump ponds, beaver ponds, small springs and short segments of a few drainages where seepage creates small pools of standing water. Wandering garter snakes (*Thamnophis elegans*) are also usually found near water, but have been observed in stands of aspen, sagebrush, and meadows. Horned lizards are present primarily in basin big sagebrush, low sagebrush, grass-forb, and barren vegetation types. The extent to which these animals are affected by fire is unknown, but most of them probably avoid fire by entering water or burrows.

Fish are rarely present on the monument since all of the streams are ephemeral. A survey of Twin Creek that was conducted a few hundred yards beyond the monument boundary by Wyoming Game and Fish Department and NPS biologists documented the presence of redside shiner (*Richardsonius balteatus*), mountain sucker (*Pantosteus*

clarki), bluehead sucker (*Catostomus discobolus*), Utah sucker (*C. ardens*), the non-native white sucker (*C. commersoni*), speckled dace (*Rhinichthys osculus*), longnose dace (*Rhinichthys cataractae*), leatherside chub (*Gila copei*), and mottled sculpin (*Cottus bairdi*). Bonneville cutthroat trout (*Onchorhynchus clarki utah*) occur further downstream in Twin Creek and in Rock Creek.

Ephemeral stream runoff from the monument delivers an unknown (but probably negligible) volume of sediment to Twin Creek and Rock Creek. The sediment load to these streams could increase following wildland or prescribed fire, but the overall contribution of sediment from the monument is still expected to be small in comparison to the sediment load contributed to these streams by other portions of their watersheds.

The effects of fires on wildlife are also influenced by scale. Small fires would result in little if any effect on wildlife populations. Large fires have the potential for greater impact since a greater area is burned. Irregular perimeters on wildland fires have the effect of creating more "edge" or interface between burned and unburned vegetation, an effect which brings greater habitat diversity. This "edge effect" can be emulated in prescribed burns through a patchy mosaic burn pattern. The resulting mosaic of vegetation creates desirable habitats for many species including sage grouse and pygmy rabbits. These mosaics also ensure that a diverse range of stand and structure of vegetation is provided for differing habitat needs.

Methodology. Information on the number of acres treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and fire return intervals. Available resource information from the monument, the Northern Colorado Plateau Network, and cooperating agencies was also considered in the analysis. Intensity of effects is defined above in Table 3.1.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Most species present in the mid-1800s are still represented in the monument fauna. Diversity and abundance of wildlife populations are robust, within the carrying capacity of the area. Population fluctuations remain within the normal range of variability.

Source – NPS Organic Act; NPS *Management Policies* (2001)

Impacts of Alternative 1: No- Action

Impact Analysis: Under this alternative, wildland fires would be suppressed. Given recent fire incidence and typical fire return intervals, an estimated one or two fires during the next 10-20 years would burn a total of about 200 acres. Direct adverse impacts would include very limited loss of habitat for short periods following fire and possible disruption of ground nests and dens due to fireline construction. Short-term indirect

adverse impacts would include temporary displacement of individuals. Long-term indirect impacts of fire exclusion would be slightly adverse as habitats become decadent and are less able to support wildlife populations.

From the standpoint of a suite of wildlife populations, the direct and indirect adverse impacts would be of short duration and small magnitude. Therefore, the direct and indirect adverse impacts of the no-action alternative on wildlife would be localized, short-term, and minor. In the long-term, the indirect effect of fire exclusion on wildlife would be minor and adverse with a loss of habitat diversity. From the standpoint of habitat-dependent species such as pygmy rabbit and sage grouse, the effects of fire exclusion on habitats that depend on wildland fire to maintain habitat diversity would be localized, minor to moderate and adverse.

Cumulative Effects: Factors that contribute to cumulative effects on wildlife and their habitats are grazing, wildland fire, mining, industrial development, hunting, and other recreational activities outside the monument. These activities may reduce the number of large ungulates in the general area and thus reduce grazing pressure within the monument. Conversely, large ungulates may move into the monument as a result of hunting and other disturbances outside of the monument. Killing of predators outside the park may have very small impacts on predation within the park. Vegetation management practices may enhance or diminish the availability of forage and cover. The direct and indirect adverse impacts of the no-action alternative would be localized, short-term, and minor. The cumulative impacts of the no-action alternative would be localized and minor.

Conclusion: The no-action alternative would have localized, short-term, and minor direct adverse impacts on wildlife. The indirect adverse impacts would be localized, short-term, and minor. The no-action alternative would not produce any major adverse impacts or impairment of wildlife whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management (preferred alternative)

Impact Analysis: The preferred alternative would result in an incremental increase of acreage burned from slightly larger wildland fires suppressed under an appropriate management response (i.e., holding fires at existing barriers rather than constructing firelines), but ground disturbance should be lessened in comparison with the no-action alternative. Direct adverse impacts would include limited loss of habitat for short periods following fire and possible disruption of ground nests and dens due to fireline construction. Short-term indirect adverse impacts would include temporary displacement of individuals. Long-term indirect impacts of fire exclusion would be slightly adverse as habitats senesce and are less able to support wildlife populations. The direct and indi-

rect adverse impacts of this aspect of the preferred alternative would be localized, short-term, and minor.

Under this alternative, a prescribed burn covering approximately 1,595 acres in predominantly sage vegetation would be burned with broadcast prescribed fire in the first 5-year period. The prescription would be designed to create a patchy burn, resulting in a mosaic of burned and unburned vegetation. Burning in aspen to regenerate the stands would treat between 25 and 100 acres every other year; a total of about 300 acres of aspen would be treated in the foreseeable future (11 years). In subsequent years, surface burning may be conducted in limber pine stands.

The direct adverse effects of prescribed burning include a short-term, localized loss of habitat and subsequent displacement of wildlife. Based on the results of studies in Dinosaur National Monument, very minor changes would be expected in abundance and diversity of small mammals and passerines in response to fire. Longer-term indirect effects on small mammals and birds would be minor and beneficial as habitats become more diverse in age and stand structure.

Pygmy rabbits appear to be highly dependent on mature basin big sagebrush stands. These rabbits are probably capable of escaping slow moving fires. With fast moving fires, some pygmy rabbits may succumb to fire or smoke; others may survive in burrows. Prescribed burns currently planned include some basin big sagebrush stands. These areas would be burned to create a patchy mosaic of burned and unburned areas in order to maintain a diversity of stand ages and structures in basin big sagebrush stands. Future 5-year plans may include proposals for small prescribed fires in basin big sagebrush communities designed to maintain a variety of successional stages. Direct adverse impacts of burning in basin big sagebrush would be the potential direct mortality or displacement of some individual pygmy rabbits. The indirect adverse impacts would be a reduction in suitable habitat for pygmy rabbits and the possibility of increased vulnerability to predation. Since the species is nearly obligate to mature sagebrush, some recycling of sagebrush stands would be necessary to provide mature stands in the future. Burning smaller blocks of basin big sage would mitigate the loss of local habitat. Indirect beneficial impacts would include a wider distribution of age classes of basin big sagebrush and their eventual maturation to preferred habitats. The direct adverse impacts of prescribed burning on pygmy rabbits would be localized, short-term, and minor. The indirect effects would be localized, longer-term, adverse and beneficial, and minor.

The direct adverse effect of prescribed burning on sage grouse may consist of losses of nests or broods if burning was conducted in the early spring. This potential impact would be mitigated by not conducting prescribed burns between March 1 and June 30 in known nesting areas. These potential direct adverse effects would be localized, short-term, and minor from a population standpoint. The indirect effects may include displacement of birds, loss or gain of seasonal habitats, increases or decreases in food availability, and increased vulnerability to predation. Some adverse impacts may be offset by

beneficial impacts. Creating patchiness in sagebrush burns would mitigate potential adverse indirect impacts. Overall, the indirect impacts of prescribed burning on sage grouse would be minor, localized, beneficial and adverse, and short-term and long-term.

The direct adverse impacts of prescribed burning on large mammals would be negligible. Elk, mule deer, and pronghorn antelope can easily escape fire. Indirect impacts would include increases in palatable forage in sagebrush, limber pine, and aspen communities. Indirect impacts would be localized, short-term to long-term, minor, and beneficial.

The direct adverse effects of prescribed burning on wildlife would therefore be short-term, localized, and minor. The indirect impacts would be localized and minor from a population perspective. The type and duration of indirect effects would vary widely among species, ranging from adverse to beneficial and from short-term to long-term. From a broader ecological perspective, the increases in diversity of wildlife habitats (e.g., stand and age structure, community composition) would create greater long-term stability for wildlife populations and therefore would be regarded as beneficial.

Mechanical reduction of hazard fuels would include thinning aspen and brush on three areas totaling about 45 acres during the first 5-year period; in subsequent periods, these areas may be re-treated and additional areas identified for treatment. As long as treatments do not occur in the nesting season, the direct adverse impacts of this facet of the preferred alternative would be short-term, localized, and negligible. The indirect adverse effects include displacement of individuals of some species. The indirect impacts are also regarded as localized, short-term, and negligible.

The responses by wildlife populations to the preferred alternative are expected to be within the normal range of variability. The direct adverse impacts would be localized, short-term, and minor. The indirect impacts would be localized and minor, but vary in duration from short-term to long-term and in type from adverse to beneficial depending on the species involved. From an ecological standpoint, the increases in diversity of wildlife habitats (e.g., stand and age structure, community composition) would create greater long-term stability for wildlife populations and therefore would be regarded as beneficial.

Mitigations to reduce impacts to wildlife from the proposed fire management plan are naturally similar to those for vegetation. They include planning treatments on a size and scale generally representative of the natural range of variability in each vegetation type's fire return interval. Mitigations designed to protect species of concern in sagebrush will generally follow those outlined in the Wyoming Guidelines for Managing Sagebrush Communities with Emphasis on Fire Management (Wyoming Interagency Vegetation Committee, 2002) and Guidelines to manage sage grouse populations and their habitats (Connelly et al. 2000) when those guidelines coincide with monument management objectives.

Cumulative Effects: Factors that contribute to cumulative effects on wildlife and their habitats are grazing, wildland fire, mining, industrial development, hunting, and other recreational activities outside the monument. These activities may reduce the number of large ungulates in the general area and thus reduce grazing pressure within the monument. Conversely, large ungulates may move into the monument as a result of hunting and other disturbances outside of the monument. Killing of predators outside the park may have very small impacts on predation within the park. Vegetation management practices may enhance or diminish the availability of forage and cover.

The direct adverse impacts of the preferred alternative would be localized, short-term, and minor. The indirect impacts would be localized and minor, but vary in duration from short-term to long-term and in type from adverse to beneficial depending on the species involved. From an ecological standpoint, the increases in diversity of wildlife habitats (e.g., stand and age structure, community composition) would create greater long-term stability for wildlife populations and therefore would be regarded as beneficial. The cumulative impacts of the preferred alternative would be localized and minor, and adverse to beneficial.

Conclusion: The preferred alternative would have localized, short-term, and minor direct adverse impacts on wildlife. The indirect impacts would be localized, short-term to long-term, minor, and adverse to beneficial. The preferred alternative would not produce any major adverse impacts or impairment of wildlife whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 3: Appropriate Management Response and Non- fire Fuels Management

Impact Analysis: With Alternative 3, there may be a slight increase in burned acreage under an appropriate management response to wildland fire, but no acres burned by prescribed fire. Use of the appropriate management response would reduce the adverse impacts of suppression activities in wildlife habitats. The direct and indirect impacts of wildland fire suppression under Alternative 3 would be similar to those described under the preferred alternative, however the absence of prescribed fire would not allow for the long-term beneficial impacts described in Alternative 2. The impact of proposed mechanical fuels reductions should be the same as described under the preferred alternative.

The direct adverse impacts of Alternative 3 would be localized, short-term, and negligible to minor. The indirect adverse effects would be localized, short-term, and negligible to minor.

Cumulative Effects: Factors that contribute to cumulative effects on wildlife and their habitats are grazing, wildland fire, mining, industrial development, hunting, and other recreational activities outside the monument. These activities may reduce the number of large ungulates in the general area and thus reduce grazing pressure within the monument. Conversely, large ungulates may move into the monument as a result of hunting and other disturbances outside of the monument. Killing of predators outside the park may have very small impacts on predation within the park. Vegetation management practices may enhance or diminish the availability of forage and cover. The direct and indirect adverse impacts of Alternative 3 would be localized, short-term, and minor. The cumulative impacts of Alternative 3 would be localized and minor.

Conclusion: Alternative 3 would have localized, short-term, and negligible direct impacts on wildlife. The indirect impacts would be localized, short-term, and negligible to minor. Alternative 3 would not produce any major adverse impacts or impairment of wildlife whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

VISITOR EXPERIENCE AND PARK OPERATIONS

Affected Environment. Visitation at Fossil Butte NM in 2002 was nearly 20,000 people with more than 85% of visits occurring in May through September. The average visit lasted about 1 hour and 30 minutes. Principal activities were driving the park road, sightseeing, photography, and visiting the Visitor Center.

The Statement for Management (NPS 1996) identifies the importance of sweeping vistas of the high desert ecosystem, badlands, and the distant Uinta and Wasatch Mountains. The rural character of the land, with few visual intrusions, evokes images of how the area may have looked prior to Asian and European settlement.

Fire management activities that have the potential to affect park operations, visitor uses, and visitor experiences include suppression, prescribed burning, and hazard fuels projects. Suppression and prescribed fire would involve having additional personnel, engines, and other equipment in the area. Temporary closures may be imposed restricting access to visitors. Hazard fuels projects would also involve additional fire personnel in the area as well as use of chainsaws and vehicles.

Methodology. Information on the number of acres treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage was estimated based on recent fire occurrence and fire return intervals. Other information was gathered from Fossil Butte National Monument documents and staff knowledge. Intensity of effects is defined above in Table 3.1.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the monument:

Desired Conditions – Visitor activities are not substantially disrupted by fire management activities. The quality of visitor experiences, particularly with respect to scenic vistas, is not adversely impacted by smoke or other fire management activities.

Source – NPS Organic Act; NPS *Management Policies*; Americans with Disabilities Act.

Impacts of Alternative 1: No- Action
Impact Analysis: The no-action alternative would continue suppression of wildland fires. Depending on the location of a wildland fire, park operations and visitor uses may be temporarily disrupted, but the disruption would probably not extend beyond a few days. Temporary closures to restrict visitor access would ensure visitor safety. Indirect adverse effects would include the presence of burned areas within views, but that would also lend another aspect to the natural scene which some would consider beneficial. Most burned areas would "green up" during the same season or, at the latest, the next spring. Given the recent fire history of one fire in the past 20 years, the direct and indirect impacts of the no-action alternative on park operations, visitor experiences, and aesthetic resources would be beneficial and adverse, localized, minor, and very short-term.

Cumulative Effects: Activities outside the monument which contribute to cumulative impacts on visitor experiences and park operations include livestock grazing, mining, industrial development, off-road vehicle use, wildland and prescribed fire, and other land management activities. The adverse impact of these activities is considered negligible to minor since most would be distant from visitor use activities and in mid-ground to far-ground views. The paved park road and monument headquarters facilities intrude on the visual scene, though they are situated so as to minimize the intrusion. No other projects are proposed within the monument that would contribute to cumulative impacts on visitor experiences and aesthetic resources. The direct and indirect adverse impacts of the no-action alternative would be localized, short-term, and minor. The cumulative effect of the no-action alternative would be localized and minor.

Conclusion: The no-action alternative would have localized, short-term, and minor direct adverse and beneficial impacts on visitor experiences and park operations. The indirect adverse impacts would be localized, short-term, and minor.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management (preferred alternative)
Impact Analysis: With the preferred alternative, there would be a minor increase in smoke production and temporarily blackened acres from (a) potential small increases in burned acreage by wildland fires managed under an appropriate management response and (b) prescribed burns. Smoke production would be of very limited duration in these

fuels – usually a few hours at most in sagebrush communities and a few days in limber pine and aspen communities. Blackened areas usually green up within weeks to months (and no later than the following spring).

Direct adverse impacts may include minor displacement of some visitor activities during prescribed burn operations, but that effect should be limited to a few hours each year. Other direct adverse impacts of increased burning on visitor experiences and park operations would include smoke in scenic views, temporary restrictions in access to some areas, and the presence of blacked areas within natural vistas. The potential direct adverse impact to visitor experiences and park operations is localized, short-term, and negligible to minor. The low frequency and small size of these fires further reduces the potential adverse impacts.

The indirect effect of the preferred alternative would be the presence of blackened areas in near to mid-range views for the remainder of the growing season. Some visitors might find this displeasing; others may find the presence of burned areas pleasing. The presence of fire, smoke, and blackened areas presents an opportunity for interpretation of natural values and processes which may provide a minor, long-term, beneficial impact. The indirect effects of this portion of the preferred alternative would be localized, short-term, minor, and adverse or beneficial.

Mechanical removal of hazardous fuels would be conducted (a) during periods of low visitation or (b) in areas of restricted public access and managed to create little visual impact or change in scenic vistas. Visitor access to the monument would not be curtailed; consequently there would be no direct adverse impacts to visitors. Indirect adverse effects would include the sound of chainsaws for very short periods of time and a somewhat changed scene as fuels near the headquarters building, picnic area, and Haddenham Cabin are reduced. Therefore, the adverse direct impacts of the preferred alternative on visitor experiences would be short-term, localized, and minor. Longer-term indirect impacts would include a reduced potential for large fires and subsequent reduced potential for substantive modifications of scenic vistas; these indirect impacts would be minor and beneficial.

Therefore, the direct adverse impacts of the preferred alternative would be localized, short-term, and minor. The indirect impacts would be short-term, localized, negligible to minor, and adverse to beneficial.

Cumulative Effects: Activities outside the monument which contribute to cumulative impacts on visitor experiences and park operations include livestock grazing, mining, industrial development, off-road vehicle use, wildland and prescribed fire, and other land management activities. The adverse impact of these activities is considered negligible to minor since most would be distant from visitor use activities and in mid-ground to far-ground views. The paved park road and monument headquarters facilities intrude on the visual scene, though they are situated so as to minimize the intrusion. No other

projects are proposed within the monument that would contribute to cumulative impacts on visitor experiences and park operations. The direct and indirect adverse impacts of the preferred alternative would be localized, short-term, and negligible to minor. Some indirect impacts of the preferred alternative would be beneficial. The cumulative effect of the preferred alternative would be localized, negligible to minor, and adverse to beneficial.

Conclusion: The preferred alternative would have localized, short-term, and minor direct adverse and beneficial impacts on visitor experiences and park operations. The indirect impacts would be localized, short-term to long-term, negligible to minor, and adverse to beneficial.

Impacts of Alternative 3: Appropriate Management Response and Non- fire Fuels Management

Impact Analysis: With Alternative 3, there may be a slight increase in burned acreage under an appropriate management response to wildland fire, but no acres burned by prescribed fire. The direct and indirect impacts of wildland fire suppression under Alternative 3 would be similar to those described under the preferred alternative. The impact of proposed mechanical fuels reductions should be the same as described under the preferred alternative.

The direct adverse impacts of Alternative 3 would be localized, short-term, and negligible to minor. The indirect adverse effects would be localized, short-term, and negligible to minor.

Cumulative Effects: Activities outside the monument which contribute to cumulative impacts on visitor experiences and park operations include livestock grazing, mining, industrial development, off-road vehicle use, wildland and prescribed fire, and other land management activities. The adverse impact of these activities is considered negligible to minor since most would be distant from visitor use activities and in mid-ground to far-ground views. The paved park road and monument headquarters facilities intrude on the visual scene, though they are situated so as to minimize the intrusion. No other projects are proposed within the monument that would contribute to cumulative impacts on visitor experiences and park operations. The direct and indirect adverse impacts of Alternative 3 would be localized, short-term, and minor. The cumulative effect of Alternative 3 would be localized and minor.

Conclusion: Alternative 3 would have localized, short-term, and minor direct and indirect adverse impacts on visitor experiences and park operations.

CULTURAL RESOURCES: ARCHEOLOGICAL RESOURCES AND HISTORIC STRUCTURES

Affected Environment. Cultural resources can be categorized as archeological resources, historic structures, cultural landscapes, ethnographic resources, and museum objects. Museum objects exist within the context of a built environment, and rarely have the potential to be affected by wildland fire. No cultural landscapes have been identified within the monument. No ethnographic resources are known to exist in the monument. As noted earlier, museum objects, cultural landscapes, and ethnographic resources were dismissed from impact analysis.

Fossil Butte NM's General Management Plan (NPS 1980) speaks very briefly about cultural resources. The Resource Management Plan (NPS 1994) provides considerably greater information. Information presented below is largely summarized from the monument's Resource Management Plan.

Archeological Resources: Cultural material from the Early or Paleo-Indian Period (12,000 – 6,500 B.C.) occurs on the surface throughout the region. The majority of regional archeological resources are surface finds and sites representing the Middle Archaic and Late Archaic Periods (2,700 B.C. – A.D. 500). Most of the sites are small, single-component remains of the Period.

Some finds from the Late Prehistoric Period (A.D. 500 – 1800) have also been made near Fossil Butte National Monument. Within the monument, isolated surface archeological materials from the Late Prehistoric and Historic Periods appear to represent short-term use.

A comprehensive survey of the park has not been completed; most existing surveys were done in support of park projects. Twelve surveys covering approximately 280 acres are on record at Fossil Butte National Monument. Twelve archeological sites were documented in those surveys. These sites have Archaic, Late Prehistoric, and/or Historic components. Four sites were determined to be not eligible for the National Register of Historic Places in consultation with the Wyoming State Historic Preservation Office; the others have not been evaluated for eligibility to include them on the National Register of Historic Places. No archeological sites have been nominated to the National Register.

Historic Structures: Only one National Register eligible historic structure is known in the monument. The Haddenham Cabin, a small wooden A-frame structure constructed circa 1918, was a temporary shelter used by early fossil collectors David Haddenham and his grandson. The Haddenham Cabin was listed on the National Register of Historic Places on December 23, 2003. The presence of several fossil fish quarrying materials may prompt some future consideration of nomination of a Historic District associated with the Haddenham Cabin.

The effects of wildland fire on archeological resources are influenced by fuel loading, soil texture and moisture, types (e.g. head fire v. backing fire) and rates of fire spread, and residence time (Ryan 2002). Fire effects, accordingly, may vary from negligible to moderate and adverse to beneficial.

Severe fires – those that burn in heavy fuel loads and exhibit long residence time and a substantial downward heat pulse – may damage buried organic and inorganic materials. In heavy continuous fuels, temperatures at the soil surface may be sufficient to damage stone or ceramic resources by scorching, fracturing, charring, and spalling. Organic matter may be distilled or destroyed at temperatures of 200-300° Centigrade. Temperatures of 500-600° C will begin to affect stone materials. Temperatures diminish rapidly with soil depth; when surface temperatures are 500° C, the temperatures at a depth of 5 cm would be only about 200°C. With light to moderate severity fires residence time is usually short and the downward heat pulse is low. Ryan (2002) notes that soil heating is commonly shallow even when surface fires are intense. Fuel loading and duff accumulations in vegetation communities at Fossil Butte NM are generally light; wildland fires would tend to have light to moderate severity. Ryan (2002) notes that fires of moderate severity may consume surface fuel layers and cause charring of the top centimeter of the mineral soil.

Monitoring of soil heating in sagebrush fires at Dinosaur National Monument (unpublished monitoring notes) seldom recorded temperatures on bare soil surfaces in excess of 120-130° F (about 50-55°C). This monitoring was conducted in environments similar to sagebrush vegetation types in Fossil Butte National Monument.

Some effects of fires on archeological sites may be beneficial. When vegetation is removed, sites may become evident and accurate inventory and mapping can be completed.

For those sites that would be vulnerable to impacts from wildland or prescribed fire, such as the Haddenham Cabin, a wide range of options are available to eliminate or mitigate potential impacts. These include complete avoidance of prescribed fire in the vicinity of structures, blacklining around structures or features near wildland fires or proposed prescribed fires, treatment with fire retardant foam prior to or concurrent with fires, wrapping with heat reflective materials, and establishing sprinkler systems on and around structures prior to prescribed fires or concurrent with wildland fire suppression activities. Other standard cultural resource mitigation measures include the following: prior to doing treatment work, conduct an inventory of previously unsurveyed areas using an archeologist who meets the Secretary of the Interior's standards; monitor fire management activities and halt work if previously unknown resources are located; protect and record newly discovered resources; brief work crews about protecting cultural resources; dispose of slash in areas lacking cultural sites; and avoid ground disturbance in areas containing known cultural sites. For prescribed fires, miti-

gations would be included in the prescribed fire burn plan. In all cases, protection of structures and features will be more important than minimizing acres burned. Consultation with the Wyoming SHPO will be conducted on each proposed prescribed fire and manual fuel reduction project during preparation of the prescribed fire burn plan or hazardous fuel reduction plan.

Methodology. Information on the number of acres treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage is estimated based on recent fire occurrence and fire return intervals. Other information was gathered from Fossil Butte NM documents and staff knowledge. Intensity of effects is defined above in Table 3.1.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Historic structures and archeological sites are identified and inventoried and their significance and integrity are evaluated under National Register criteria. The qualities that contribute to the eligibility for listing or listing of historic properties or archeological sites on the National Register are protected in accordance with the Secretary of the Interior's Standards.

Source – National Historic Preservation Act; Executive Order 11593; Archeological and Historic Preservation Act; Archeological Resources Protection Act; the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation; Programmatic Memorandum of Agreement Among the NPS, Advisory Council on Historic Preservation, and the National Council of State Historic Preservation Officers (1995); NPS Organic Act; NPS Management Policies.

Impacts of Alternative 1: No- Action
Impact Analysis: Under this alternative, wildland fires would be suppressed at the smallest reasonable acreage. Fuels may accumulate over time with this alternative, resulting in an elevated potential for high intensity or high severity fires and damage to cultural resources. Given recent fire incidence and typical fire return intervals, an estimated one or two fires would burn about 200 acres during the next 10-20 years. Fire suppression activities in fine fuels include construction of "scratch" lines, blacklining, use of swatters, and direct attack with water. Fire suppression in heavier fuels would include construction of a handline to mineral soil and/or direct attack with water. Management constraints (see Description of Alternatives) note that retardant may be used; that off-road use of equipment such as engines is warranted only if the potential disturbance they would cause is less than resource damage from fire; and that heavy equipment such as bulldozers would be used only in the event of threats to human life or fire-susceptible historic properties. A wide range of mitigation measures (see Affected Environment above) is also available for use concurrent with fire occurrence.

Archeological Resources

Due to the relatively short fire return intervals in fuel types in Fossil Butte NM, wildland fires have probably burned over the archeological resources many times their original deposition. Since most of the areas within the monument are in Condition Class 1 or 2, the fire behavior and fire intensity associated with future fires will probably be within the normal range of variation.

Heat from typical surface fires in sagebrush, aspen, and mixed conifer/limber pine communities would be insufficient to damage artifacts and other archeological materials in subsurface settings even if they are buried only a few centimeters below the ground surface. The direct adverse impacts of fire on archeological resources at Fossil Butte NM would generally be negligible. Fire may also expose archeological resources as vegetation is removed. This may allow the discovery, more accurate mapping, and/or more complete assessment or archeological resources. This indirect effect would be short-term to long-term, minor, and beneficial.

The direct adverse impacts of fire suppression on archeological resources under the no-action alternative would be to displace surface materials, expose buried archeological materials during handline construction, or disturb materials immediately below the surface with vehicle use. The indirect effects include exposure of artifacts to erosion and theft. Given (a) very infrequent fire occurrence, (b) small fire size, and (c) implementation of identified mitigations and management constraints, the direct and indirect adverse effects of the no-action alternative on archeological resources would be localized and minor.

Historic Structures

The direct adverse impact of wildland fire on historic structures could be destruction or damage to the structures if fire contacts the structures directly. In the case of historic structures at Fossil Butte NM, the discontinuities of fuels near the Haddenham Cabin diminish the possibility of this impact. The direct adverse impact of fire suppression on historic structures would be limited to the potential to damage such structures by contact with fire fighting equipment. Indirect adverse impacts include the possibility of smoke damage. The direct and indirect adverse effects of fire suppression on historic structures under the no-action alternative would be localized and negligible to minor. Given very infrequent fire occurrence and small fire size, the likelihood of such adverse effects is further diminished.

The direct adverse impacts of the no-action alternative on cultural resources would therefore be localized, short-term, and negligible to minor. The indirect impacts of the no-action alternative on cultural resources would be localized, short-term, minor, and adverse to beneficial.

Cumulative Effects: Both within and outside the monument, natural erosion and aging contribute to cumulative effects on archeological resources and historic structures. Vandalism or theft may also diminish their values. Other activities outside the monument that contribute to cumulative effects include grazing, mining and fossil quarrying, wildland fire, off-road vehicle travel, and collecting. No projects or activities are proposed in the monument in the foreseeable future that would contribute to cumulative effects. The direct adverse impacts of the no-action alternative would be localized and minor. The indirect adverse impacts would be localized and minor. The cumulative effects of the no-action alternative are regarded as adverse, localized, and minor.

Conclusion: The no-action alternative would have localized and minor adverse direct impacts on cultural resources. The indirect impacts would be adverse and beneficial, localized, short-term, and minor. The no-action alternative would not produce any major adverse impacts or impairment of cultural resources whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management (preferred alternative)

Impact Analysis: As noted under the no-action alternative, the effects of wildland fire on surface and subsurface artifacts vary with fuel loading and fire behavior. More severe fire on surface artifacts may cause scorching, fracturing, charring, and spalling. If artifacts are buried under as little as 1 cm of soil, the effects are far less. Head fires generate a smaller downward heat pulse than do backing fires. With prescribed burning, use of head fires can reduce any potential impact on unknown surface archeological resources.

Fire suppression and prescribed fire activities in fine fuels include construction of "scratch" lines, handlines, blacklining, use of swatters and other hand tools, and direct attack with water. Fire suppression in heavier fuels would include construction of a handline to mineral soil and/or direct attack with water. Management constraints (see Description of Alternatives) note that retardant may be used; that off-road use of equipment such as engines is warranted only if the potential disturbance they would cause is less than resource damage from fire; and that heavy equipment such as bulldozers would be used only in the event of threats to human life or fire-susceptible historic properties. A wide range of mitigation measures (see Affected Environment above) is also available for use concurrent with fire occurrence.

The amount of fire on the landscape would be increased under the preferred alternative. With use of appropriate management responses to wildland fires, acreage may increase slightly as natural and man-made barriers are used in lieu of constructed firelines. Prescribed fires would generally be designed to avoid historic resources. Fire prescriptions would be designed to minimize soil heating and thus avoid impacts to buried archeological resources. If prescribed burning is proposed near the historic Haddenham

Cabin and related resources, the prescribed burn plan would specify actions to avoid or mitigate potential adverse impacts to known structures or features.

Mechanical reduction of hazardous wildland fuels would be conducted near the picnic area, monument headquarters, and the Haddenham Cabin during the first 5-year period. Mechanical reduction of hazardous fuels in later years would continue to focus on visitor use areas and vulnerable cultural resources.

Archeological Resources

Heat from typical surface fires in sagebrush, aspen, and mixed conifer/limber pine communities would be insufficient to damage artifacts and other archeological materials in subsurface settings even if they are buried only a few centimeters below the ground surface. The direct adverse impacts of fire on archeological resources at Fossil Butte NM would generally be negligible. Fire may also expose archeological resources as vegetation is removed. This may allow the discovery, more accurate mapping, and/or more complete assessment or archeological resources. This indirect effect would be short-term to long-term, minor, and beneficial.

With the preferred alternative, a slightly larger acreage may burn as appropriate management responses are implemented. This, however, would result in fewer firelines and avoidance of known archeological sites. The direct adverse impacts of fire suppression on archeological resources under the preferred alternative would be to displace surface materials, expose buried archeological materials during hand-line construction, or disturb materials immediately below the surface with vehicle use. In sagebrush, however, the initial attack would focus on using natural barriers and other tactics with minimal ground disturbance. Fire would have a higher resistance to control in limber pine and aspen communities, but with an appropriate management response, control lines could be located in areas of lighter fuels. The indirect adverse effects of wildland fire suppression include exposure of artifacts to erosion and theft. With implementation of identified mitigations and management constraints, the direct and indirect adverse effects of wildland fire suppression on archeological resources under the preferred alternative would be localized and minor. The relative infrequency and small size of wildland fires would further diminish the probability of adverse impacts.

In implementing prescribed burns, known archeological sites could be avoided during preparation of control lines. The direct adverse impacts of prescribed burning would be to damage stone or ceramic resources by scorching, fracturing, charring, and spalling if fire severity is quite high. However, fire severity in shrublands (especially with head fires) and surface fires in limber pine and aspen would usually elevate temperatures at the ground surface only slightly. Fire behavior monitoring on prescribed fires at Dinosaur National Monument seldom indicated soil surface temperatures exceeding 120-130° F. Prescribed fires would be designed to avoid known

archeological sites with surface organic material. Indirect adverse impacts include exposure of surface artifacts to erosion or theft. Most burned shrublands would "green up" within the same season or, at the latest, the next spring. Regrowth would then diminish the possibility of artifacts being eroded or stolen. Thus the direct and indirect adverse impacts of prescribed burning would be localized, short-term, and minor.

Most mechanical hazardous fuels reduction would occur in visitor use areas. The direct adverse impact of mechanical hazard fuel reductions would be exposure of materials due to ground disturbance by vehicles associated with the activities. Indirect adverse impacts would include exposure of artifacts to erosion and theft. With avoidance of known archeological resources and implementation of mitigation actions, the direct and indirect adverse impacts of hazard fuel reductions would be localized, short-term, and minor.

Historic Structures

Again, slightly more acres may be burned when wildland fires are managed under an appropriate management response. The direct adverse impact of wildland fire on historic structures could be destruction or damage to the structures if fire contacts the structures directly. In the case of historic structures at Fossil Butte NM, the discontinuities of fuels near the Haddenham Cabin diminish the possibility of this impact. The direct adverse impact of fire suppression on historic structures would be limited to the potential to damage such structures by contact with fire fighting equipment. Indirect adverse impacts include the possibility of smoke damage. Given the proposed hazard fuel reduction near the Haddenham Cabin, the direct and indirect adverse effects of fire suppression on historic structures under the preferred alternative would be localized and negligible to minor. The relative infrequency and small size of wildland fires would further diminish the probability of adverse impacts on historic structures.

Most prescribed burning would not be conducted near the Haddenham Cabin. When prescribed burning is proposed near the cabin, one or more of the mitigations mentioned under the Alternatives section above would be included in the prescribed fire plan and implemented prior to ignition. With mitigations in place, there should be no direct adverse impacts to the cabin. Indirect adverse impacts would include smoke drifting into the cabin. Prescriptions using wind directions that move smoke away from the structure would reduce or eliminate this effect. Given the location of prescribed fires and typically small burn block size, the direct and indirect adverse impacts of prescribed burning on the Haddenham Cabin would be localized, short-term, and negligible to minor.

Initially, mechanical hazardous fuels reduction would occur near visitor use areas and the Haddenham Cabin. There would be no direct adverse impacts of mechani-

cal hazardous fuels reduction actions to the Haddenham Cabin. Indirect beneficial impacts would include reducing the threat of wildland fire near the cabin, reducing the potential damage of vegetation encroachment on the cabin, and preserving a more historic scene at the site. The indirect impacts would be localized, short-term to long-term, negligible to minor, and beneficial.

The direct and indirect adverse impacts of the preferred alternative on historic structures would be localized, short-term, and negligible to minor. Long-term indirect impacts would be beneficial.

Therefore, the direct adverse impacts of the preferred alternative on the cultural resources would be localized, short-term, and minor. The indirect impacts would be localized, short-term to long-term, negligible to minor, and adverse or beneficial.

Section 106 Summary: Historic properties likely to occur in Fossil Butte NM were determined by reviewing past survey work and previously recorded sites, and in consultation with affected Indian tribes. The Advisory Council on Historic Preservation's criteria of adverse effect (36 CFR Part 800.5, *Assessment of Adverse Effects*) were applied to those predicted resource types. The National Park Service concludes that with proposed mitigation, implementation of the preferred alternative would have *no adverse effect* on cultural resources at Fossil Butte National Monument. Project specific consultation would be completed with the Wyoming SHPO prior to implementation of any prescribed burn or manual or mechanical fuel reduction projects.

Cumulative Effects: Both within and outside the monument, natural erosion and aging contribute to cumulative effects on archeological resources and historic structures. Vandalism or theft may also diminish their values. Other activities outside the monument that contribute to cumulative effects include grazing, mining and fossil quarrying, wildland fire, off-road vehicle travel, and collecting. No projects or activities are proposed in the monument in the foreseeable future that would contribute to cumulative effects. The direct adverse impacts of the preferred alternative on the cultural resources would be localized and minor. The indirect impacts would be localized, short-term to long-term, negligible to minor, and adverse or beneficial. The cumulative effects of the preferred alternative are regarded as adverse to beneficial, localized, and minor.

Conclusion: The preferred alternative would have localized and minor direct adverse impacts on cultural resources. The indirect impacts would be localized, short-term, minor, and adverse to beneficial. The preferred alternative would not produce any major adverse impacts or impairment of cultural resources whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 3: Appropriate Management Response and Non- fire Fuels Management

Impact Analysis: With Alternative 3, there may be a slight increase in burned acreage under an appropriate management response to wildland fire, but no acres burned by prescribed fire. The direct and indirect impacts of wildland fire and fire suppression under Alternative 3 would be similar to those described under the preferred alternative. Since prescribed fire is not authorized under Alternative 3, there would be no direct or indirect impacts attributed to prescribed fire. The impact of proposed mechanical fuels reductions should be the same as described under the preferred alternative.

The direct adverse impacts of Alternative 3 would be localized, short-term, and negligible to minor. The short-term indirect effects would be localized and negligible to minor. Long-term indirect impacts would be beneficial.

Cumulative Effects: Both within and outside the monument, natural erosion and aging contribute to cumulative effects on archeological resources and historic structures. Vandalism or theft may also diminish their values. Other activities outside the monument that contribute to cumulative effects include grazing, mining and fossil quarrying, wildland fire, off-road vehicle travel, and collecting. No projects or activities are proposed in the monument in the foreseeable future that would contribute to cumulative effects. The direct adverse impacts of Alternative 3 on the cultural resources would be localized and minor. The indirect impacts would be localized, short-term to long-term, negligible to minor, and adverse or beneficial. The cumulative effects of Alternative 3 are regarded as adverse to beneficial, localized, and minor.

Conclusion: Alternative 3 would have localized and minor direct impacts on cultural resources. The indirect impacts would be localized, short-term, minor, and adverse to beneficial. Alternative 3 would not produce any major adverse impacts or impairment of cultural resources whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

PALEONTOLOGICAL RESOURCES

Affected Environment. The monument was established in 1972 specifically to preserved outstanding paleontological sites and related geological phenomena. Two geologic formations at Fossil Butte National Monument contain significant fossil remains: the Green River Formation with its buff colored buttes and the Wasatch Formation of bright red-banded badlands. The significance of the two formations is the completeness of the fossil record for this period of geologic time. The greatest concentration of fossils is found in the middle unit of the Green River Formation. The Wasatch Formation contains some of the earliest Eocene mammals in North America.

Fossil quarrying began about 1881 and continued until establishment of the monument in 1972. Erosion, theft, and vandalism contribute to the continued loss of fossil resources.

The fossil-bearing areas are characterized by steep slopes and sparse to no vegetation. Where vegetation exists it is of a nature (e.g., cushion plants) and density that it will generally not carry fire.

Methodology. Information on the number of acres treated by mechanical methods and prescribed fire was used to estimate impacts. Wildland fire acreage was estimated based on recent fire occurrence and fire return intervals. Other information was gathered from Fossil Butte NM documents and staff knowledge. Intensity of effects is defined above in Table 3.1.

Regulations and Policies. Current laws and policies require that the following conditions be achieved in the park:

Desired Conditions – Fossil resources are protected from human-induced damage for future scientific and interpretive purposes. Fire management actions do not adversely impact fossil resources.

Source – NPS Organic Act; NPS *Management Policies*.

Impacts of Alternative 1: No- Action
Impact Analysis: Under this alternative, wildland fires would be suppressed at the smallest reasonable acreage. Given recent fire incidence and typical fire return intervals, an estimated one or two fires would burn about 200 acres during the next 10-20 years.

Direct adverse impact of wildland fire could include spalling of rock surfaces with high severity fire. With the near absence of vegetation/fuels on fossil-bearing substrates, it is very unlikely that wildland fire would carry onto those substrates and even more unlikely that fires would have high severity. Further, if there are areas where the vegetation is continuous enough to carry fire, it is most likely that those areas would have burned multiple times in the past. Thus the direct adverse impacts of wildland fire on fossil resources would be localized and negligible. Indirect effects of wildland fire may include the potential for increased exposure of fossil-bearing strata and subsequent erosion. The indirect impacts would be localized and negligible.

Potential direct adverse impacts from fire suppression efforts consist of disturbances from fireline construction and firefighting vehicles. Given the steep slopes and sparse vegetation, it is very unlikely that fireline construction and fire-fighting vehicle use would occur on or adjacent to fossil-bearing resources. However unlikely the impacts would be, the potential would be mitigated by advising firefighters to avoid ground disturbing activities near known fossil resources. Thus the direct adverse impacts on fossil resources would be localized and negligible. Indirect effects of fire suppression may in-

clude the potential for increased exposure of fossil-bearing strata and subsequent erosion. The indirect impacts would be localized and negligible.

Cumulative Effects: Both inside and outside the monument, natural erosion, theft, and vandalism contribute to cumulative effects on fossil resources. While natural erosion is a widespread process, vandalism and theft would be localized impacts. Other activities outside the monument that contribute to cumulative effects include grazing, mining and fossil quarrying, wildland fire, off-road vehicle travel, and collecting. The adverse impacts of these activities would be localized and negligible to minor. No projects or activities are proposed in the monument in the foreseeable future that would contribute to cumulative effects. The direct adverse impacts of the no-action alternative would be localized and negligible. The indirect adverse impacts would be localized and negligible. The cumulative effects of the no-action alternative would be localized and negligible to minor.

Conclusion: The direct and indirect impacts of the no-action alternative on paleontological resources would be localized and negligible. The no-action alternative would not produce any major adverse impacts or impairment of paleontological resources whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 2: Appropriate Management Response and Integrated Fuels Management (preferred alternative)
Impact Analysis: With the preferred alternative, there may be an incremental increase in burned acreage under an appropriate management response to wildland fire.

Direct adverse impact of wildland fire could include spalling of rock surfaces with high severity. With the near absence of vegetation/fuels on fossil-bearing substrates, it is very unlikely that wildland fire would carry onto those substrates and even more unlikely that fires would have high severity. Further, if there are areas where the vegetation is continuous enough to carry fire, it is most likely that those areas would have burned multiple times in the past. Thus the direct adverse impacts of wildland fire on fossil resources would be localized and negligible. Indirect effects of wildland fire may include the potential for increased exposure of fossil-bearing strata and subsequent erosion. The indirect impacts would be localized and negligible.

Potential direct adverse impacts from an appropriate management response to wildland fire consist of disturbances from fireline construction and firefighting vehicles. Given the steep slopes and sparse vegetation, it is very unlikely that fireline construction and fire-fighting vehicle use would occur on or adjacent to fossil-bearing resources. The capability to use natural barriers for fire containment would lessen the potential of indirect impacts from fireline construction or use of firefighting vehicles on fossil-bearing substrates. However unlikely the impacts would be, the potential would be mitigated

by advising firefighters to avoid ground disturbing activities near known fossil resources. Thus the direct adverse impacts on fossil resources would be localized and negligible. Indirect effects of an appropriate management response to wildland fire may include the potential for increased exposure of fossil-bearing strata and subsequent erosion. The indirect impacts would be localized and negligible.

Prescribed burning is not proposed on known fossil-bearing substrates. The only direct adverse impact that is identified is the potential for surface damage by fire management equipment in burn block preparation and holding on prescribed fires adjacent to fossil-bearing areas. If prescribed burning is proposed adjacent to fossil-bearing areas, this potential direct adverse impact would be mitigated by briefing fire staff and avoiding known areas. The direct adverse impacts, therefore, would be localized and negligible. Indirect effects of prescribed burning may include the potential for increased exposure of fossil-bearing strata and subsequent erosion. The indirect impacts would be localized and negligible.

Mechanical reductions of hazard fuels are focused on areas that have sufficient buildup of wildland fuels to pose a potential hazard to protected resources. Since the known fossil-bearing areas have little or no vegetation and no unnatural fuel buildup, fuels reduction projects are not proposed on fossil-bearing substrates. Therefore, no direct or indirect adverse impacts accrue from this portion of the preferred alternative.

The direct and indirect impacts of the preferred alternative on paleontological resources would be negligible.

Cumulative Effects: Both inside and outside the monument, natural erosion, theft, and vandalism contribute to cumulative effects on fossil resources. While natural erosion is a widespread process, vandalism and theft would be localized impacts. Other activities outside the monument that contribute to cumulative effects include grazing, mining and fossil quarrying, wildland fire, off-road vehicle travel, and collecting. The adverse impacts of these activities would be localized and negligible to minor. No projects or activities are proposed in the monument in the foreseeable future that would contribute to cumulative effects. The direct adverse impacts of the preferred alternative would be localized and negligible. The indirect adverse impacts would be localized and negligible. The cumulative effects of the no-action alternative would be localized and negligible to minor.

Conclusion: The direct and indirect impacts of the preferred alternative on paleontological resources would be localized and negligible. The preferred alternative would not produce any major adverse impacts or impairment of paleontological resources whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Impacts of Alternative 3: Appropriate Management Response and Non- fire Fuels Management

Impact Analysis: With Alternative 3, there may be a slight increase in burned acreage under an appropriate management response to wildland fire, but no acres burned by prescribed fire. The direct and indirect impacts of wildland fire and fire suppression under Alternative 3 would be similar to those described under the preferred alternative. Since prescribed fire is not authorized under Alternative 3, there would be no direct or indirect impacts attributed to prescribed fire. The impact of proposed mechanical fuels reductions should be the same as described under the preferred alternative.

The direct adverse impacts of Alternative 3 would be localized and negligible. The indirect adverse effects would be localized and negligible.

Cumulative Effects: Both inside and outside the monument, natural erosion, theft, and vandalism contribute to cumulative effects on fossil resources. While natural erosion is a widespread process, vandalism and theft would be localized impacts. Other activities outside the monument that contribute to cumulative effects include grazing, mining and fossil quarrying, wildland fire, off-road vehicle travel, and collecting. The adverse impacts of these activities would be localized and negligible to minor. No projects or activities are proposed in the monument in the foreseeable future that would contribute to cumulative effects. The direct adverse impacts of Alternative 3 would be localized and negligible. The indirect adverse impacts would be localized and negligible. The cumulative effects of Alternative 3 would be localized and negligible to minor.

Conclusion: The direct and indirect impacts of Alternative 3 on paleontological resources would be localized and negligible. Alternative 3 would not produce any major adverse impacts or impairment of paleontological resources whose conservation is necessary to the purpose of the establishment of the monument, that are key to the natural or cultural integrity of the monument, or that are actions identified as a management goal of the monument.

Chapter 4 – CONSULTATION/COORDINATION

Agencies/Organizations/Persons Contacted During Scoping

Federal Agencies
U.S. Fish and Wildlife Service
Bureau of Land Management
U.S. Forest Service
Advisory Council on Historic Preservation

Tribal Governments
Shoshone Tribal Council
Shoshone Cultural Office
Shoshone-Bannock Tribal Council
Shoshone-Bannock Tribes
Northern Arapaho Business Council
Ute Tribe Business Council
Ute Tribe Cultural Resources

State and Local Governments and Agencies
Wyoming State Historic Preservation Officer
Wyoming Game and Fish Department
Wyoming Department of Agriculture
Office of State Lands and Investments
Wyoming State Grazing Board
Lincoln County Commission
Bear Lake Regional Commission

Other Organizations and Individuals
Wyoming State Senator Delaine Roberts, District 16
Jon Child
Don, Failoni, Failoni Land and Livestock
Robert Fox
Truman Julian, Julian Land and Livestock
Ernest Thornock, Thornock Ranch
Jon Marvel and John Carter, Western Watersheds Project
Susan Hunzie
Darrel J. Short
Mildred Parks Revocable Trust
Ronald Thompson, Thompson Land and Livestock
Wyoming Wildlife Federation
National Wildlife Federation
Wyoming Outdoor Council

William Laycock, Univ. of Wyoming Range Department
Norris Tratnik
Stan Cooper
Union Pacific
Northwest Pipeline Corp.
Richard Lewis
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Preparers

Stephen Petersburg, Wildland Fire Associates
David McGinnis, Superintendent, Fossil Butte National Monument
Clayton Kyte, Biological Technician, Fossil Butte National Monument
Lisa Elenz, Fire Management Officer, Grand Teton National Park
Chip Collins, Assistant Fire Management Officer, Grand Teton National Park
Diane Abendroth, Fire Effects Monitor, Grand Teton National Park

List of EA Recipients

Federal Agencies

U.S. Fish and Wildlife Service
Bureau of Land Management
U.S. Forest Service
Natural Resource Conservation Service

Tribal Governments

Shoshone Tribal Council
Shoshone Cultural Office
Shoshone-Bannock Tribal Council
Shoshone-Bannock Tribes
Northern Arapaho Business Council
Ute Tribe Business Council
Ute Tribe Cultural Resources

State and Local Agencies

Wyoming State Senator Delaine Roberts, District 16
Wyoming State Historic Preservation Officer
Wyoming Game and Fish Department
Wyoming Department of Agriculture
Office of State Lands and Investments
Wyoming State Grazing Board
Lincoln County Commission
Bear Lake Regional Commission

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Figure 1. Fossil Butte National Monument Vicinity Map

Figure 2. Fossil Butte NM Boundary and Facilities

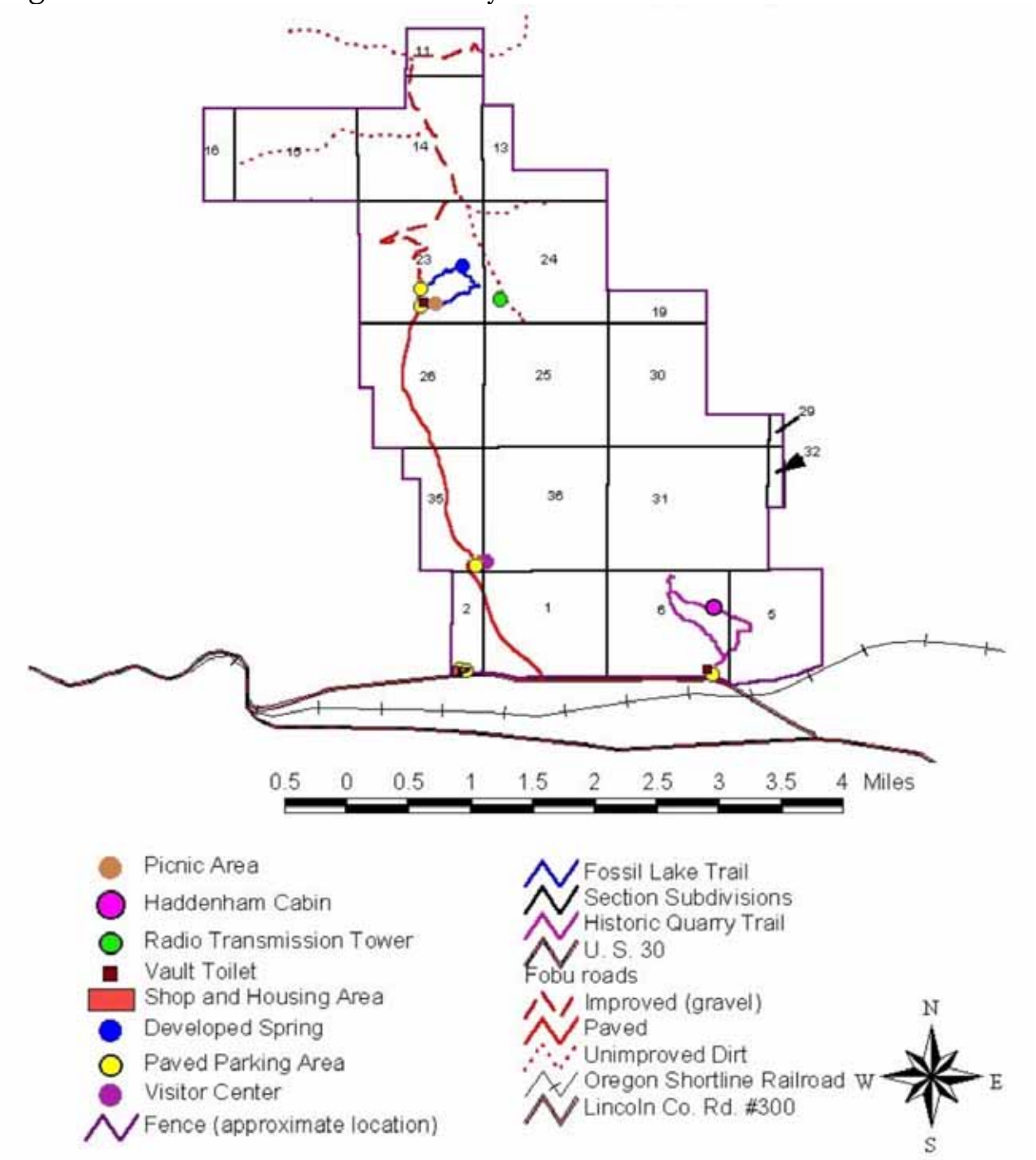


Figure 3. Fossil Butte NM Vegetation Map

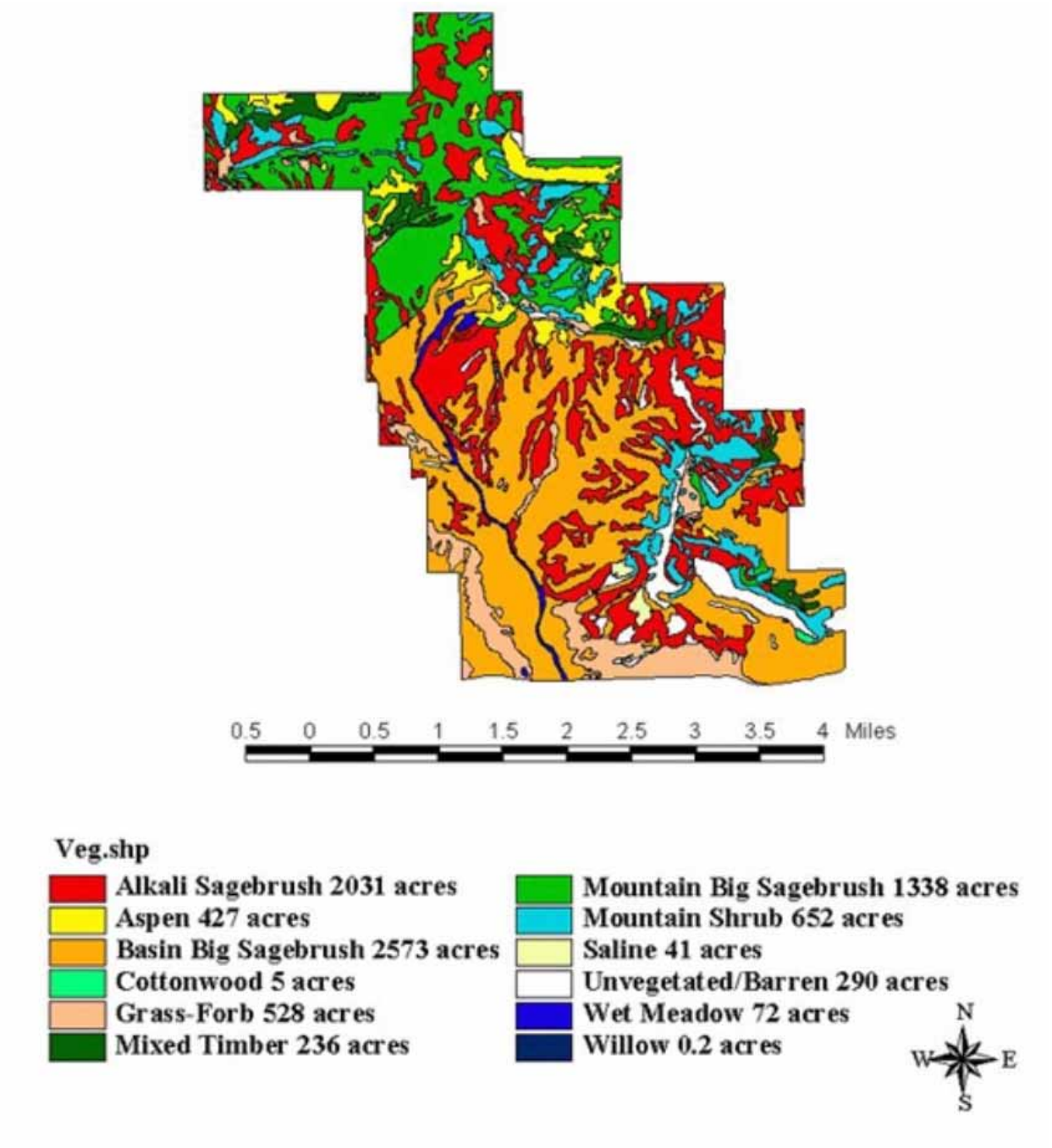
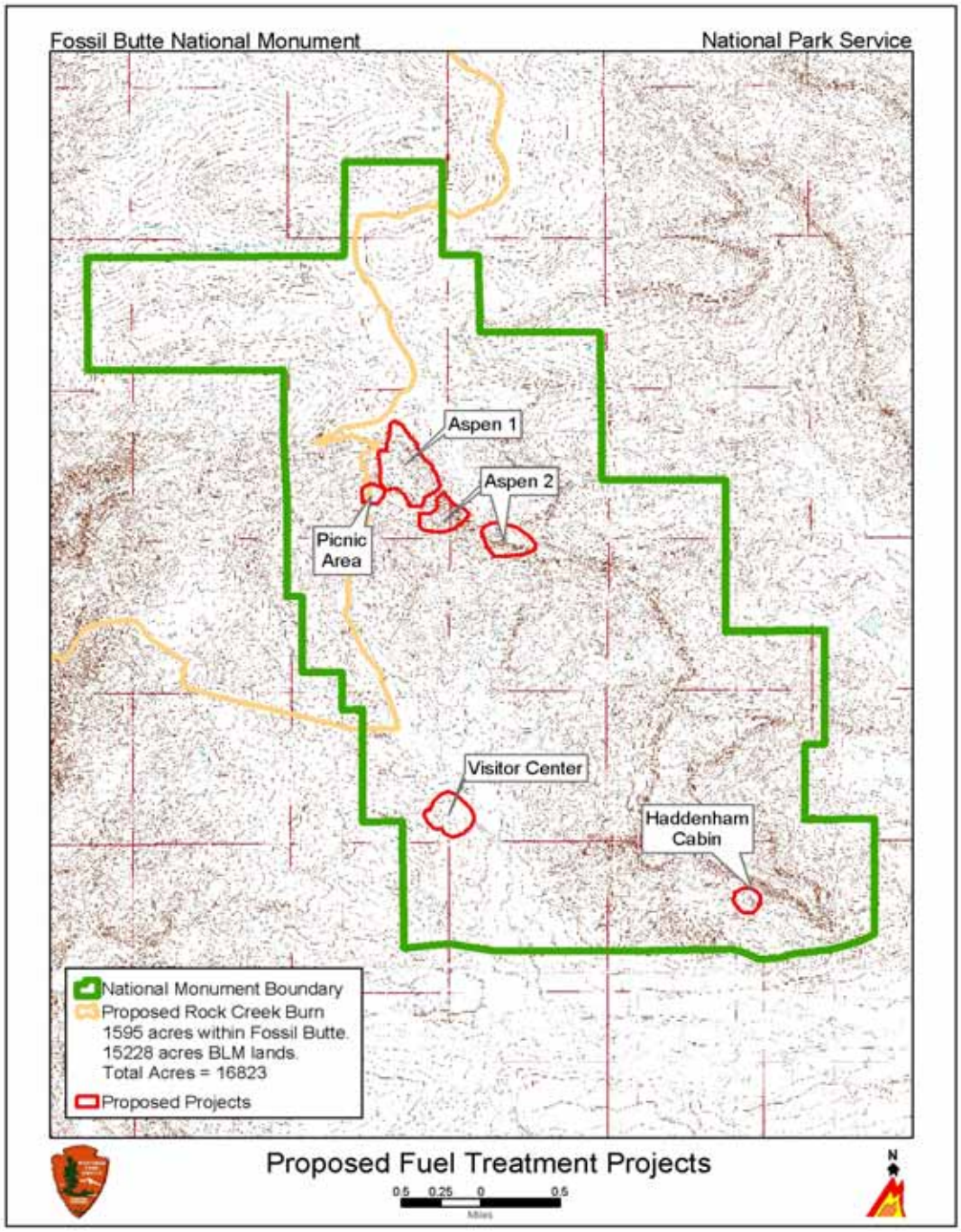


Figure 4: Proposed Fuel Treatment Projects



Appendix 1. Fire Management Terms

Appropriate Management Response – Specific actions taken in response to a wildland fire to implement protection and fire use objectives. Appropriate management response considers a variety of factors such as cost, firefighter safety, effectiveness of actions, and resource values. Using this concept, managers may choose to utilize natural or man-made barriers in a confine strategy to lower cost, increase firefighter safety, or minimize the impacts of suppression actions.

Confine – Confinement is the strategy employed in appropriate management responses where a fire perimeter is managed by a combination of direct and indirect actions and use of natural topographic features, fuel, and weather.

Fire Management Plan (FMP) – A strategic plan that defines a program to manage wildland and prescribed fires and fuels management activities, and documents the Fire Management Program in the approved land use plan. The plan may be supplemented by operational plans such as preparedness plans, preplanned dispatch plans, prescribed fire plans and prevention plans.

Fire Management Unit (FMU) – Any land management areas definable by objectives, topographic features, access, values-to-be-protected, or major fire regimes, etc., that set it apart from management characteristics of an adjacent unit. FMUs are delineated in FMPs. These units may have dominant management objectives and preselected strategies assigned to these objectives.

Fire Regime – A general classification of the role fire would play across a landscape in the absence of modern human intervention, but including the influence of aboriginal burning. The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency or fire return interval) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation. The five fire regimes include:

I 0-35 year frequency and low (surface fires most common) to mixed severity (less than 75% of the dominant overstory replaced).

II 0-35 year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced).

III 35-100+ year frequency and mixed severity (less than 75% of the dominant overstory vegetation replaced).

IV 35-100+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced).

V 200+ year frequency and high (stand replacement) severity (greater than 75% of the dominant overstory vegetation replaced).

Fire Regime Condition Class (Condition Class) – A classification of the amount of departure from the natural fire regime. The departure results in changes to one (or more) of the following ecological components: vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern); fuel composition; fire frequency, severity and pattern; and other associated disturbances (e.g. insect and disease mortality, grazing, drought).

Condition Classes may be delineated as follows:

Condition Class 1

- The historic disturbance regime is largely intact and functioning (e.g. has not missed a fire return interval).
- Potential intensity and severity of fire within historic range.
- Effects of disease and insects within historic ranges.
- Hydrologic functions within normal historic range.
- Vegetation composition and structure resilient to disturbances.
- Nonnative species are currently not present or present in limited extent.
- Risk of loss of key ecosystem components is low.

Condition Class 2

- Moderate alterations to historic disturbance regime evident (e.g. missed one or more fire return intervals).
- Effects of disease and insects pose an increased risk of loss of key community components.
- Riparian areas and associated hydrologic function show measurable signs of adverse departure from historic conditions.
- Vegetation composition and structure shifted toward conditions less resilient to disturbances.
- Populations of nonnative species may have increased, increasing the risk of further increases following disturbance.

Condition Class 3

- Historic disturbance regime significantly altered; historic disturbance processes and effects may be precluded (e.g. missed several fire return intervals).
- Effects of disturbance (fire, insects, disease) may cause significant or complete loss of key community components.
- Hydrologic functions may be adversely altered; high potential for increased sedimentation and reduced streamflows.

- Invasive species may be common and in some cases the dominant species on the landscape; disturbance will likely increase both the dominance and geographic extent of these invasive species.
- Highly altered vegetation composition and structure predisposes community to disturbance events outside the range of historic variability; disturbance may have effects not observed/measured before.

Initial Attack – An aggressive suppression action consistent with firefighter safety and values to be protected.

LCES – An acronym for "**L**ookouts, **C**ommunications, **E**scape routes, **S**afety zones." This is a reminder of safety considerations for firefighters: to post lookouts, ensure good communications among fireline personnel, ensure all personnel know their escape routes, and know the location of safety zones. It is also a means of mitigating risk associated with potential fire behavior.

Live Fuel Moisture – A measure of the amount of moisture in living fuels. It is calculated as:

$$\frac{\text{Wet weight-Dry weight}}{\text{Dry Weight}} \times 100 = \text{live fuel moisture percentage}$$

Live fuel moisture in sagebrush usually exceeds 100% until mid-summer.

NFFL Fuel Models – These are mathematical models designed to characterize various fuel complexes in terms of fuel particle size, loading, presence and amount of live fuels, surface to volume ratio and other characters. Fuels have been classified into four groups: grass, brush, timber and slash. When these models are used in fire prediction programs, outputs include flame length, rates of spread, fire intensity and other indices of interest to fire managers.

For a moderately severe summer day with warm temperatures and fairly low relative humidity, the following fire behavior may be expected in fuel types present in Fossil Butte NM. These numbers assume a continuous fuel complex (i.e. fires at the NHS in Fuel Model 1 would likely be smaller because fuel beds are not continuous).

Fuel Model	Fuel Type	Flame Length (ft.)	Forward Rate of Spread (ft./min.)	Size after One Hour (acres)
1	Grass	5	109	457
2	Grass with timber overstory	7	40	63

5	Sagebrush	7	27	28
8	Timber with light understory fuels	1	2	0.2

The information in the table was generated through a BEHAVE run with the following inputs: 1-HR fuel moisture – 4%, 10-HR fuel moisture – 6%, 100-HR fuel moisture – 8%, live fuel moisture – 100%, midflame windspeed – 5 mph, slope – 0%.

Prescribed Fire – Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and compliance requirements must be met, prior to ignition.

Prescribed Fire Plan – A plan required for each fire application ignited by managers. It must be prepared by qualified personnel and approved by the appropriate agency administrator prior to implementation. Each plan will follow specific agency direction and must include critical elements described in agency manuals. Formats for plan development may vary among agencies, although contents are similar.

Prescription – Measurable criteria that define condition under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

Wildland Fire – Any non-structure fire, other than prescribed fire, from any ignition source that occurs in wildland. Ignition causes include lightning, volcanic action, escaped campfires, arson, railroad sparks, smoking, trash burning, etc.

Wildland Fire Suppression – An appropriate management response to wildland fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire. All wildland fire suppression activities provide for firefighter and public safety as the highest consideration, but minimize loss of resource values, economic expenditures, and/or the use of critical firefighting resources.

Wildland Fire Use – The management of naturally ignited wildland fires to accomplish specific prestated resource management objectives in predefined geographic areas outlined in FMPs.

Where appropriate, the above definitions of fire management terms are drawn directly from the *Wildland and Prescribed Fire Management Policy: Implementation Procedures Reference*

Appendix 2. Preliminary Fire Condition Class Ratings for Vegetation Types at Fossil Butte National Monument

Community Type	Fire Return Interval, years	Condition Class	Comments
Aspen	80-100	2	One fire event would bring this to condition class 1 unless elk and deer browsing prevent suckers from attaining tree stature. Management actions such as fencing may be needed with severe browse levels.
Limber Pine/ Douglas Fir	100-200 for stand replacement, 8-21 years for isolated patch fires.	1-2	According to fire scar data, small fires occurred every 8-21 years. Fire in this vegetation type was historically patchy due to rocky substrates. Stand replacing fires are more rare. Burning would maintain condition class 1.
Mountain Mahogany/ Mountain Shrub	50-70, 20-40	1-2	Fire in mountain mahogany was historically patchy. This vegetation is approaching condition class 2. Adjacent mountain shrub vegetation is also approaching condition class 2 and will need to be burned soon to maintain condition class 1.
Mountain/ Vasey Big Sagebrush	10-30	1-2	Sagebrush historically burned frequently in a mosaic pattern. Mature patches have particular value for wildlife. A percentage of this vegetation type should be burned to maintain its condition class.
Basin Big Sagebrush	15-70	2	Uncontrolled wildfire threatens this important vegetation type. Mechanical treatments near buildings are needed to protect them. Prescribed burning in a small percentage of this habitat would move it toward condition class 1 over the long term.
Grass-Forb	unknown	1	Grass-forb communities are mixed with sagebrush, ridgetop, and riparian vegetation. Prescribed burning will maintain these as condition class 1.
Alkali/Low Sagebrush	10-90	1	This vegetation historically burned infrequently due to sparse fuels. Prescribed fire is not likely to carry through these areas.

Appendix 3. Initial 5- year plan of proposed prescribed burns and mechanical fuel treatments.

Project Name	Treatment	Acres Total burn unit or project treatment area size	Scheduled[1]
Rock Creek (BLM/NPS)[2]	RX fire (broadcast)	(NPS) 1,595 (total 16,823)	Year 2
Aspen[3]	RX fire (broadcast)	50	Year 3
Aspen	RX fire (broadcast)	50	Year 5
Total RX fire		1,895	
Picnic Area	Mechanical[4]	15	Year 3
Visitor Center	Mechanical	20	Year 3
Haddenham Cabin	Mechanical	10	Year 3
Total Mechanical		45	

[1] Approximate years following approval of the Fire Management Plan.

[2] A post-burn mosaic is expected. The prescribed fire burn plan projects removal of 30-60% of the sagebrush within the burn unit. Conifer stands within the unit would not be burned.

[3] A total of 300 acres are proposed for burning with individual burn blocks about 50 acres. Burning would occur every other year beginning in about Year 3 after approval of the Fire Management Plan

[4] Mechanical treatments would be used to clear vegetation away from structures, cultural resources, and other high value resources to reduce spread potential and increase defensible space. Mechanical reduction of hazard fuels would use methods such as mowing grass, chopping shrubs, thinning woodlands, trimming ladder fuels, and removal of harvested biomass. Pile burning may occur following mechanical treatments.

Appendix 4. Acronyms

AMR	Appropriate management response
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DO	Director's Order
EA	Environmental Assessment
EO	Executive Order
FEIS	Fire Effects Information System
FMP	Fire Management Plan
FWS	U.S. Fish and Wildlife Service
GMP	General Management Plan
LCES	Lookouts, communications, escape routes, safety zones
NEPA	National Environmental Policy Act
NFFL	Northern Forest Fire Laboratory
NHPA	National Historic Preservation Act
NM	National Monument
NRCS	Natural Resources Conservation Service
NPS	National Park Service
RM	Reference Manual
SHPO	State Historic Preservation Officer
USDI	United States Department of the Interior